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Copies of the Year Book, Regulations, and Candidates' Certificates may be had on application at the Society's House, Kensington Gore, London, S.W. 7

CONTENTS

Authors are alone responsible for their respective statements.

No. 1. **January 1918.**

Page

Address at Opening of Session, 12 Nov. 1917. Colonel Sir Thomas Holdich, K.C.M.G., K.C.I.E., C.B., President 1

Geographical War Problems in the Near East. Colonel Sir Thomas Holdich, K.C.M.G, K.C.I.E., C.B., President 3

Study of a Dune Belt. W. J. Harding King (*Plan, Section, and* 4 *Plates*) 16

The Future of International Science 33

The *Aurora* Relief Expedition, 1916–1917. Captain J. K. Davis . . 35

Glaciers and Passes of the Karakoram (*Sketch*) 38

Sir Clements Markham. J. S. K. 43

The Present Time-Table on the Cape to Cairo Route 45

Reviews:—

Through Lapland with Skis and Reindeer. E. A. P. — Il Trentino. L. C.-M. — German East Africa. F. R. C. — Marching on Tanga. F. R. C. — A Year of Costa Rican Natural History. H. O. F. — The Black Man's Part in the War. F. R. C. — Modern Man and his Forerunners. E. A. P. 47

The Monthly Record:—

Origin of the "Moëres" of Flanders.—The Location of the Cassiterides.—Return of Commandant Tilho.—The Rainfall of California.—Ice in the Arctic Seas.—Oceanographical Investigations by the *Bache* in the Western Atlantic, 1914.—Prof. Albrecht Penck.—Books for British Prisoners 53

Correspondence—The Pilgrimage of Symon Semeonis. Sir Rennell Rodd.—The Inca Treasure of Llanganati. Major E. C. Brooks.—Prof. Bowman's 'Andes of Southern Peru.' Mark Jefferson . . . 58

Meetings: Royal Geographical Society: Session 1917–1918 64

No. 2. **February 1918.**

The Geography of the Italian Front. Magg. Cav. Filippo De Filippi, Hon. K.C.I.E. (4 *Panoramas*, 2 *Plates, and Map*) 65

The Pilgrimage of Symon Semeonis: A Contribution to the History of Mediæval Travel (*continued*). Mario Esposito 77

Standard Time at Sea 97

The Work of Colloids in Sandbank and Delta Formation. Edward C. Barton (4 *Diagrams*) 100

The Turks and the Balkans. M. E. Durham 115

Reviews:—

La France de l'Est. G. G. C. — On the Eaves of the World. W. R. Carles. — Paraguay. W. S. B. 119

Page

The Monthly Record :—
Donation towards cost of *Journal*.—Geological Regions of Oxfordshire. — Snowfall in Tripoli. — The Coastal Plain and Piedmont Plateau of the Eastern United States.—Return of Mr. Stefánsson.—The Climatic Control of Settlement.—Honours for British Geographers.—De Fleure's "Human Regions": Erratum . . . 123
Meetings: Royal Geographical Society: Session 1917–1918 . . . 128

Map.
Sketch-map of the Austro-Italian Front to illustrate the paper by Magg. Cav. F. De Filippi . . . . . *following* 128

No. 3. March 1918.

East Africa. General the Rt. Hon. J. C. Smuts (*Map and 2 Plates*) . 129
The Future of Siberia. Colonel Harald Swayne, C.M.G., R.E. (2 *Sketch-maps and* 4 *Plates*) 149
Notes on the South-Western Area of "German" East Africa. Owen Letcher (2 *Plates*) 164
Routes from the Panjab to Turkestan and China recorded by William Finch (1611): Discussed by Sir Aurel Stein 172
The Problem of the Himalaya and the Gangetic Trough. A. Morley Davies 175
Reviews :—
Itinerari Albanesi. J. S. B. — Shells as Evidence of the Migration of Early Culture. E. A. Parkyn. — The Life of Sir Colin C. Scott Moncrieff, K.C.S.I., K.C.M.G., R.E. J. S. K. 183
The Monthly Record :—
The Effect of Proposals for the Creation of an "International State" in Tropical Africa.—Germany and Africa.—Heights of Mexican Mountains.—The Name of "Zone" Time 188
Meetings: Royal Geographical Society: Session 1917–1918 . . . 192

Maps.
Sketch-map showing the limits of "Mittelafrika" to illustrate the address by General Smuts . . . . . *facing* 140
The German conception of "Mittelafrika" and the political division of the continent before the war . . . . . *facing* 141
Sketch-map of the Russian Dominions and Neighbouring Countries . 151
Sketch-map showing Colonel H. Swayne's Route in Siberia . . . 153
East Africa, 1/5,000,000, to illustrate the address by General Smuts *following* 192

No. 4. April 1918.

The Jordan Valley and its Lakes. E. W. G. Masterman, M.D. (*Section, Sketch-map, Diagram, and* 4 *Plates*) 193
The Drift of the *Endurance*. Lieut. J. M. Wordie, R.F.A. (2 *Plates and Map*) 216
Halley's Magnetic Variation Charts. E. A. Reeves 237
The Work of Commandant Tilho in Tibesti and Wadai (*Sketch-map and* 2 *Plates*) 240

Page

British Interests in Spitsbergen 245
Discussion on Mr. Harding King's Paper "Study of a Dune Belt" . 250
Climate of North-West Africa. Major H. G. Lyons 258
Reviews:—
Trentino e Trieste. L. C. M. — Japan Day by Day (1877–1883). Poultney Bigelow.—Correction to Review in January *Journal*.— The Geology and Mineral Industry of South-West Africa. A. M. D. — An Anthropogeographical Study of the Origin of the Eskimo Culture. W. A. T. — Modern Whaling and Bear-hunting. W. S. B. — The *Sunbeam* R.Y.S. Voyages and Experiences in many Waters. W. P.—Volcanic Studies in Many Lands. A. M. D. 261
The Monthly Record:—
The Etang de Berre.—Population and Rainfall in Apulia.—Tree and Forest Limits in Northern Russia.—Records of Pioneer Work in Australia.—Who originated Mercator's Projection? 267
Correspondence—Glacier streams in winter. Douglas W. Freshfield. The "radigthe" of Symon Semeonis. F. Gleadow 271
Meetings: Royal Geographical Society: Session 1917–1918 272

Maps.

Sketch-map of Palestine to illustrate the paper by Dr. Masterman . . 196
Sketch-map to illustrate the work of Commandant Tilho 242
Chart to illustrate Lieut. Wordie's paper on the Drift of the *Endurance* *following* 272

No. 5. May 1918.

The London Society's Map, with its Proposals for the Improvement of London. Sir Aston Webb, R.A. (3 *Plates*) 273
Belgium and Germany in Africa. Lieut. Comte Renaud de Briey (5 *Plates*) 293
The Voyage of the *Karluk*, and its Tragic Ending. Ernest F. Chafe, Corporal, Newfoundland R. 307
A Police Patrol in the North-West Territories of Canada. C. D. La Nauze, Inspector R.N.W. Mounted Police (2 *Plates*) 316
Mr. Carmichael: An Early Traveller in the Syrian Desert. Douglas Carruthers and F. D. Harford 323
The Real Wheat Question. L. W. Lyde 325
Reviews:
A History of Poland from the Earliest Times to the Present Day. Nevill Forbes. — My Siberian Year. W. A. T. — Missione Stefanini-Paoli. E. L. — In Canada's Wonderful Northland. — Quito to Bogotá. W. A. T. — La Soberania Chilena en las Islas al sur del Canal Beagle. W. A. T. 329
The Monthly Record:—
Medals and Awards.—British Glass-sands.—Germany and Morocco. Can the Climate of the Kalahari be improved?—The Argentine Station in the South Orkneys.—The Return of Mr. Stefánsson.— Foundation of Professorship of Geography.—Meetings for the Discussion of Geophysical Subjects 335
Correspondence—Montenegrin History in 1912: a reply to Miss Durham's Review in the February *Journal* 338
Meetings: Royal Geographical Society: Session 1917–1918 340

Map.

Page

Sketch-map to illustrate the Comte de Briey's paper, and the relation of the Congo–Nile Watershed to the Great Lakes 293

No. 6. **June 1918.**

My Second Year's Journey on the Tibetan Border of Kansu. Reginald Farrer (4 *Plates*) 341

The Forest Region of North-East Russia and its Importance to Great Britain. E. P. Stebbing (*Sketch-map and* 2 *Plates*) 359

The Possibility of Aerial Reconnaissance in the Himalaya. Dr. A. M. Kellas (2 *Plates*) 374

The South-East Face of Mount Kenya. Captain G. St. J. Orde-Brown, R.A. 389

The Arrangement of the Rural Population in Picardy and Flanders. Captain M. Aurousseau, M.C., A.I.F. 393

Reviews :—

The Thames Highway. O. J. R. H. — Cleator and Cleator Moor. C. B. F. — Alsace-Lorraine. — History of Africa south of the Zambesi from . . . 1505 to the Conquest of the Cape Colony by the British. F. R. C. — A History of South Africa. F. R. C. — Chile. — Expédition Isachsen au Spitsberg 1909–10. R. N. R. B. — Survey of North-East Greenland. W. A. T. — Plants, Seeds, and Currents in the West Indies and Azores. A. G. T. 394

The Monthly Record :—

Water-power in Scotland. — Proposed Canal from Genoa to Lake Maggiore.—The Site of Constantinople.—The Sea-route to the Far East under the Roman Empire.—The Length of the Jordan.—Progressive Desiccation in the Senegal Region.—The Discovery of Clipperton Atoll.—Summer Time.—New Sources of Food Supply . 401

Obituary—Mr. John Claude White, C.I.E. 407

Meetings : Royal Geographical Society : Session 1917–1918 408

Index 409

Map.

Sketch-map to illustrate paper by E. P. Stebbing 360

The Geographical Journal

Vol. LI No. 1 January 1918

ADDRESS AT OPENING OF SESSION, 12 NOV. 1917

Colonel Sir Thomas Holdich, K.C.M.G., K.C.I.E., C.B., President

WE deeply regret that the Society is not to have this evening the pleasure of hearing the distinguished soldier and statesman whom we are proud to include in the list of Honorary Members. He has been called away by the urgent needs of the critical situation in Italy; and we must all hope that a way may be found to bring effective help to our allies. We are grateful to General Smuts for his promise that the address on East Africa to which we are looking forward with such keen interest shall not be deferred a day longer than is required by his paramount duty. Meanwhile we have one slight consolation, that the delay will allow us to provide for his lecture a better map than would have been possible on the original date.

The events of the recess have been few. Few travellers have returned to England, except those very interesting members of our Society whose mouths are closed by official discipline, and who may not for the moment tell us anything of what geographers have been doing in the East. When the time to which we look forward so earnestly arrives, and their lips are unsealed, we shall see a remarkable advance in our knowledge of those countries which though comparatively close to civilization have been hermetically closed to survey, and almost to exploration. A few accomplished travellers have indeed been able with some difficulty and not without danger to traverse that most unknown land, Central Arabia, within the last few years, and I think that when the El Djauf sheet of the 1/M map is published you will be surprised to see how much has been made by Mr. Carruthers of what has been until now an almost absolute blank. We have been glad to hear again in the last few weeks that the 1/M map is daily proving its value, and justifying the rashness with which we attempted at the outbreak of war to produce in a hurry the map that the governments of Europe had attacked so leisurely in days of peace.

I am glad to tell you that we have still reason to be thankful for the strength that the Society is showing in these difficult times. The number of new Fellows elected to-day is forty-three, and nineteen more proposals came before the Council this afternoon. These figures are not so large as

in the palmy days before the war; but they show that the work of the Society appeals to many, and we may well hope that the interest in geography excited by the great problems in hand will bring us continued accessions of strength. We shall need all the support that the friends of geography can give, for the strain upon our resources is not light. May I mention just one fact that confronts us at the moment? Owing to the great rise in the cost of paper and printing, the *Journal* if maintained at its present size would cost us £1200 more next year than last. Some reduction is inevitable, but we are resolved that it shall be as little as possible; and the task of carrying on without sensibly reducing our *Journal* (at the time when we feel that it ought to be especially useful) will be lightened if any who may be thinking in a spirit of economy that they should retire from the Society will believe on second thoughts that it would be a contemptible economy; and if on the other hand those who have friends who are on the brink of joining will apply the necessary small impetus in the required direction.

The resignations, I am proud to say, have been by no means abnormal —not greatly in excess of those in times of peace. But we have to fill up the places of those who have fallen. And in a Society like ours, numbering so many of the most active members of the community, and especially including, as the Society has always done, a large proportion of the officers of His Majesty's forces, the list of those that we have in sorrow added to our Roll of Honour has been sadly long. One name in particular I would mention to-night—that of the gallant soldier and intrepid explorer to whom so lately as last May we awarded one of the Gold Medals. General Rawling had done splendid service in the war; and we know how ardently he was looking forward to the conclusion of peace, and to the chance of that exploration of the approaches to Mount Everest which we believed would, in the hands of himself and his chosen colleagues, lead to a successful attack on that most fascinating peak. He has left us the inspiration; and I shall have you with me when I say that for Rawling's sake we must leave no stone unturned to carry through at the earliest possible moment what he would have done had he lived.

Finally I have an announcement to make that will, I am sure, be gratifying to you. The Council resolved last summer to add to our very restricted list of Honorary Members the names of not more than six Englishmen who had rendered good service to the State and to Geography. My predecessor in the chair, almost as his last act, announced the names of two—Lord Bryce and General Smuts. I am happy to tell you to-day that at the unanimous invitation of the Council Mr. Arthur Balfour has accepted Honorary Membership of the Society.

GEOGRAPHICAL WAR PROBLEMS IN THE NEAR EAST

Colonel Sir Thomas Holdich, K.C.M.G., K.C.I.E., C.B., President

Read at the Meeting of the Society, 12 *November* 1917.

TO attempt to deal in detail with all the war complications that arise from geographical distributions and conformations in the Near East is obviously beyond the capacity of one address; but I may be able to point out a few of the more important, which affect nearly the whole field of Balkan politics, and have greatly influenced the shaping and progress of the war. Public interest lies chiefly with those provinces and nationalities which intervene between Germany and the realization of Pan-German aspirations, and it is with these that I propose to deal as well as I can. Italy, Poland, the Balkan States, and Turkey are all concerned directly or indirectly with the progress of the Teuton eastwards. The vast bulk of Russia also overshadows that ideal; but Russia's interest in the eastern edge of European political geography has yet to be formulated. It may not be in future what it has been in the past.

We can hardly touch the fundamental motives underlying those disagreements, which have so often led to war in the past, without recognizing that nine-tenths of them arise from geographical inequalities, and that haphazard intermixture of nationalities which occurs in nearly every borderland of Europe. We may for the present set aside that most potent disease—megolomania—which has set in motion some of the greatest world-contests and is essentially the cause of the present war, because the disease is simply a lust for world-domination, and does not imply any real grievance arising from restricted space or the want of a sphere for national development. Such a cause of war is more or less exceptional. Far oftener does it arise from the great problems of distribution of surplus population due to the natural expansion of a people who, seeking "a place in the sun," have from the earliest ages swarmed over indefinite borderlands into alien territories and profoundly affected the destinies of the civilized world. Although this everlasting tide of human movement has ebbed and flowed more rapidly in such regions as America, Africa, or the Far East, yet it is a strong war-provoking movement still in Europe. It may happen that the adjustment of peoples to an environment which will meet their aspirations after economic development becomes a purely geographical problem. We may be called on ere long to assist in such adjustments in the interests of peace and international security. One of the great principles to observe will be that of dividing self-governing States and nations into separate geographical units in such a manner as to set definite and scientific barriers between countries liable to mutual aggression; but undoubtedly the greatest of all is

to give to each individual State such space and opportunity for internal development as may remove all incentive to discontent and aggression. This is not to be effected on any invariable basis of racial affinity or community of language or religion or culture. There can be no such criterion applicable to all the infinite variety of international disputes which arise between people of one race and one language. But the racial idea furnishes a certain platform to start from, and will generally lead to direct expression of the will and wishes of the people concerned (which is all-important) and indicate the geographical environment which will give them their heart's desire. If a nation is to stand as a solid four-square tower of strength in the cause of security, justice, and humanity, absolute unity of sentiment and ideal is a necessity amongst her people, and we find this often enough in communities which include the most extraordinary admixture of races, such, for instance, as exist in the United States of America, or in some of the South American Republics, where it is as strongly developed as amid the solid Teutonic races of Germany. Hitherto the thorny political problem of "settlement" in the Balkans, which has been the problem of centuries, has been strangely dissociated from geographical issues: and yet there are no people in the world so moulded and shaped by their geographical environment as these people of the Near East. The stamp of the untameable mountaineer is on the Montenegrin; the hardness and strength of the Serbian is but an index of the quality of his scanty plains and barren hills; the Greek is as cosmopolitan, as uncertain, and as difficult as his own rugged coasts can make him, with all their facilities for trade and commercial adventure. The incidents of geography, too, have tended to maintain the separation of Balkan peoples of varied origin. The old world Illyrian of classic story has clung to his ancient hills; and beyond doubt the Rumanians have for centuries retained a fairly compact national entity on the original soil of Roman conquest. All alike, Slav, Hun, Greek, Rumanian and Albanian, have felt the weight of the Turkish fist; and it has been rather the necessity for combination against a common foe than for any international bond of affection that the Balkan States have in the past combined by twos and by threes to fight for their right of independent existence. We might well consider whether, had all the States been peace-loving and unmilitary democracies, they would not have been confederated long ago under one Turk or Teuton or Slav overlord.

What, then, are the geographical conditions required for an environment which should keep a people contented and happy? The first is undoubtedly space. There must be room enough for development on the lines best suited to the character and strength of the people. Need I point to the West, to America, Canada, the Argentine, or even to Brazil, to illustrate the advantage of having room for all comers, if combined with the power of assimilating all comers into one patriotic whole under a sympathetic government? Need I point to Ireland as an

example of what happens when two communities so far removed from each other in ideal and character as are the Gael and Kelt (yet speaking the same language) find space too restricted for mutual independence.

Then follow the vital questions of cultivable areas and opportunity for internal communications and external trade. A nation must have fertile soil sufficient to support the population, or she must have command of external means of communication by sea or by land which may bring the needful supplies. That is to say, she must be self-supporting, or, like England or Japan, she must possess good ports and command of sea communications. Hardly less important are the geographical opportunities for internal communication by road or rail which represent the arterial system of the land, and through which pulsates the life-blood of her trade and enterprise. These are perhaps the chief geographical characteristics of a country which conduce to contentment and peace. There are others, no doubt, but it is by the presence or absence of these that we will consider the relative position of the Balkan States to-day.

First it will be well to consider the fundamental lines of structure in the Near East which have shaped present geographical configuration. From the Mediterranean coast north of Corsica mountain ranges extend continuously to the Carpathians and Balkans, with a branch south-eastwards which becomes the Dinaric Alps. The sea once enclosed within the double curve of Transylvanian and Carpathian Alps dried up, leaving the Danube to break through the chain at the Iron Gates and to become the principal waterway of the Balkan States: the open way to the Black Sea. The limestone which forms the outer or marginal folds of the Central Alps is the predominant feature in the Dinarics of Dalmatia. Weathering has reduced this limestone to the remarkable condition of rugged complexity which is prevalent in the Karst country, where bare, hard rock is riddled with depressions, producing a strange formation of natural holes and caves which may well be compared with the shell-holes and underground connections of Flanders. The Dinaric system extends to Montenegro, and similar formations continue in Albania and Greece. In Dalmatia the Dinarics are not high, but abnormally rugged and difficult, with few passes, and practically no waterways intersecting them. The fundamental conformation is like that in similar geological conditions elsewhere—notably on the frontiers of India and Persia. Parallel ridges following the line of the Adriatic coast in Dalmatia and Albania present successive walls of rugged, hard, uncompromising rock, absolutely barring communication between the Adriatic and the Balkan interior throughout their greater extent. No streams of any consequence force their way through these limestone barriers from their eastern uplands north of Montenegro. The Narenta alone effects a passage, of which advantage has been taken by a narrow-gauge line of railway through the Narenta gorge, with a "rack and pinion" section over the divide to Serajevo, the capital of Bosnia. The ancient Roman road which once started from

Spalato has not developed into a railway connection with the interior, and Dalmatia east of the Dinarics is cut off from the Dalmatia of the coast-line by a geographical barrier which, were it not for the Adriatic depression, would form the geographical boundary of Eastern Italy. This coast region is essentially Italian in the physical character of its landscape as in the social and commercial aspect of its principal towns, but we are told by Sir Arthur Evans that in spite of the prevalence of Italian characteristics and language it is as absolutely Serbian in its racial ingredients as any part of Dalmatia east of the Dinarics. There is no real national division.

Between the picturesque ports of Ragusa or Spalato and the interior there has been through the middle ages a considerable caravan traffic, which once extended from Ragusa to Constantinople; but for the purposes of modern commercial traffic there is practically no highway from the Serbian uplands to a port on the Adriatic coast. South of Montenegro the geographical position is much the same, though there is one opening into the Boyana estuary, where the Drin breaks through the successive lime-stone walls and forces a way to the Adriatic by a succession of gorges. The time may indeed come when the upper waters of the Drin will carry on their banks a railway, and that railway may be engineered to a port on the coast; but the time is not yet. The same may be said of the Albanian ports of Durazzo and Avlona with their beautiful harbours. It is for the future to provide Albania with capital to develop these lines of access to the sea, a future which can be only dimly discerned at present; and meanwhile Serbia is shut off from the Adriatic. For of all the Dalmatian, Montenegrin, and Albanian streams which run from the frontier ranges on the east with a westerly course to the sea, not one affords any present prospect of an opening for Serbian commerce.

Observe the consequence of this geographical conformation on the east of the Adriatic. The traffic of the Balkan Peninsula is forced into a comparatively narrow way between the impassable Dinarics and the great wedge-shaped uplands of the Rhodope—a passage which through all history has been the main link between Central Europe and the Ægean, connecting Belgrade with Salonika. Here indeed is there a fair amount of fertility, and some of the best agricultural lands are to be found in the folds of the hills which encompass that highway. This passage now becomes of paramount importance to the German programme for the spread of Pan-Germanism. At present it is in German hands, where we trust it may not remain. It has always been the great highway for invasion; and for that reason it has ever been sparsely populated, and its economic possibilities neglected.

The problem arising from want of communications between the Adriatic coast and the interior resolves itself into this. Austria and the Hungarian plains must if they can keep the precious outlet to the sea which is marked by the ports of Trieste and Fiume. Bosnia and Herzegovina, again, have no other outlet, because their drainage systems trend

northward through deep canyons and difficult approaches to the Save. Commercially unimportant as these States may be, they still are a part of Austria; and strategically they maintain her hold on the Istrian ports and the Adriatic. Dalmatia also has strategic importance as a factor in Austrian domination of the Adriatic. Such is Austria's position. Obviously Dalmatia is equally important in any scheme for a Jugo-Slav federation which would include Bosnia, Herzegovina, and Croatia; while the coast of Dalmatia, or at least certain positions on that coast, are essential to Italy if she is to dispute Austria's position of complete Adriatic control. This, of course, is the crux of the quarrel between Italy and Austria. Nothing else much matters if the command of the Adriatic is secured. It is in this interest that Italy has declared a protectorate over Albania and occupied Avlona, which safeguards the straits of Otranto; and it is this that she will have to settle with the reconstituted Serbia.

Consider these broad features of the geography of the Balkan States and you will find the main lines of their history expressed therein. They have been flanked to the northward and eastward for centuries by the wild undeveloped steppes of Russia, and to the south by the penalizing influences of Greek and Turk misgovernment: with the forbidding wall of the Dinaric system shutting off the Adriatic from economic use, and the central uplands of Rhodope forcing trade and agriculture into narrow transverse ways, subject to all the devastation of periodic armed invasion. How could continuous economic development be possible? What could be expected but a rough and virile race of people who, sprung from northern conquerors, Slavs, Mongols or Huns, are but the reproduction of their progenitors in an environment which favours most of their original characteristics?

Throughout history the Danube has been the commercial highway of the Balkan States; but the great waterway of the Danube leads only to the Black Sea, and is there locked by the gateway of the Dardanelles. Small wonder then that Balkan States dependent on this one sole exit for their export trade regard with the greatest suspicion any change in the guardianship of those gates. To the south the basins of the Vardar and Maritsa were till lately cut off from their outlets in the Ægean by Greece and Turkey, thus establishing a permanent grievance with Serbia and Bulgaria. The commercial highways of the more northern Balkan States —those arteries along which the life-blood of the nations flows—have been in perpetual dispute, until finally the greatest dispute of all has arisen from the claims of Germany to absorb the chief of them, not at all for the development or benefit of the States concerned, but for the furtherance of her own ambitious programme. Out of the turmoil of war a way must be found for peace and contentment in the Balkans by the recognition of those geographical interests which are essential to the prosperity of each community individually.

It is, of course, inevitable that political and geographical interests

should often clash in the settlement of Balkan territories. Into the political aspect of the questions which arise in such arrangements it is impossible to enter here. We can indeed only very superficially refer to certain geographical elements which may either support or hinder the realization of what we know to be the aspirations after independence of certain communities. To begin with the Slav problems. The northern or Czecho-Slovak community occupy Bohemia and Hungary. They were once directly connected with the southern Slavs, but are now separated geographically and to a certain extent ethnically and linguistically. The result of the escape of the Southern Slavs from Austrian domination would be to leave some eight or nine million Czecho-Slovaks with about twenty million Austro-Magyars in the northern provinces—a position so unfavourable that the Czecho-Slovaks most strongly strike for separation and independence. Undoubtedly the formation of an independent Czecho-Slovak State would tend to the disruption of Austria-Hungary. Undoubtedly also such a disruption would be favourable to our policy of preventing the realization of the Pan-German programme; but can it be effected without the support of Russia, or independent of the Southern Slavs?

What is the geographical position? The Czechs and Slovaks together occupy a block of territory which extends westward from the Carpathians for about 450 miles to the frontiers of Bavaria. The average width of the territory they occupy is about 100 miles, but it narrows considerably a little west of the river March, which flows through Moravia from the north to join the Danube above Preszburg, and approximately divides the Czechs of Bohemia from the Slovaks of north Hungary. The Czechs who occupy all Central Bohemia with a nearly closed ring of Germans round them, use the word Czech to designate the whole country of Bohemia; and the French have adopted the Slav designation. The Slovaks extend from the March river, approximately, through northern Hungary to the Carpathians, so that ethnographically the Czecho-Slovak State (the new Bohemia) is buttressed by Germans and Poles on the north, west, and east (for Silesia is chiefly German), and by Austro-Germans and Magyars on the south. That is to say, the new State would be in immediate contact with northern Slavs (Poles and Ruthenes), but separated from the southern Slavs (Croats and Serbs) by Austria and Hungary. The Germans, who are the ruling class within the limits of Bohemia, Moravia, and Slovakia, are said to amount to about eight and a half millions, *i.e.* are about equal to the Czechs and Slovaks. In the province of Silesia they form a very large majority.

Nothing can exceed the complexity of race distributions throughout Central Europe and the Near East, and the problem of disentanglement of the racial elements intermingled on almost any borderland, so as to set a definite wedge between them, is practically impossible of solution. Naturally the German and Austrian frontiers of such a new State would

require the most careful consideration, and it is here that the racial element seems to defy a sound geographical solution of the problem. The territory of Bohemia amounts to about 20,000 square miles of the basin of the upper Elbe, and includes the valleys of the Adler, Iser, the upper Moldau and the Eger. A ring of mountains divides it from Bavaria, Saxony, Silesia, and the basin of the Danube; and so far, in spite of certain weaknesses in detail, it would appear to be one of the best protected kingdoms in Europe. But the German population (as I have said) occupies a nearly solid ring round the Czechs within the mountains; and the important Eger valley, forming a useful line of lateral communication with the Elbe, is in their hands. Such an occupation cannot possibly be reconciled with any scheme for a sound defensive frontier to the new State. Eastwards from Bohemia it is enough to say that the northern boundary of the Czecho-Slovak territory is fairly well carried by an effective line of mountain divides (leaving Silesia to the north), until it reaches the divide between the Oder and the Danube at the well-known Moravian gap, the focus of German railways west of Krakau. From here it links up with an extension of the Carpathians. The Slovaks occupy the northern provinces of Hungary, but do not extend beyond the river Ung.

The southern boundary of the new State would be far more difficult to define with any scientific soundness; but it is not by any means impossible, although throughout its length of about 500 miles it would be crossed at intervals by important rivers and many lines of approach. Geographically speaking, it is not the southern boundary but the problem of disposing of the Germans within the mountain ring fence of Bohemia that would prove the crux of the problem. Whether a new Slav state can be cut in a solid block out of Austro-Hungary without the moral and material support of Russia is another element for consideration which is beyond our inquiry.

With the southern Slavs the geographical conditions are comparatively simple. An excellent map prepared by Sir Arthur Evans will show fairly well what is the extent of their aspirations. The federation of all the Jugo-Slav States into one nationality, a federation which would unite Slovenes, Croats, and Serbs under one flag, would establish a new power of the first class in mid-Europe to face any Germanic combination that might arise. The Slovenes, who by blood, language, and tradition are one with Croats and Serbs, holding the same aims and ideals of national life, occupy the most westerly of the Jugo-Slav provinces and are consequently most exposed to German aggression. Behind this Slovene barrier Croats, Serbs, and Montenegrins have developed their national character in comparative security. The Slovenes maintain a racial majority throughout a wide extent of most beautiful country. They are to be found in Styria, Carniola, Carinthia, Gorizia, Gradisca, Istria, and in the basin of the Isonzo, thus forming a barrier between Germany and the Adriatic.

Jugo-Slavia extends from the northern rim of the Save basin and the

valley of the Danube to the southern limit of Serbia; and within those limits the Slav element constitutes 90 per cent. of the population. We are reckoning with an area of at least 75,000 square miles, which is nearly as much as England and Scotland together. Within these limits there are approximately twelve and a half million Slavs, of whom some eight millions would be freed from Austrian domination. No fear need be entertained for the future of a Jugo-Slav nationality with such well-protected frontiers as those indicated by pre-war boundaries. The eastern boundary of Serbia would be more scientifically adjusted to natural features if it passed through the main divide (at the Dragoman Pass) between the Nishava and the Isker, instead of cutting off the head of the Nishava. On the whole, however, the boundaries of the pre-war Serbia are strongly defined, and well adapted for defence against aggression.

The most important politico-geographical feature in Serbia is undoubtedly the comparatively narrow valley of the Morava and its tributary the Nishava. This is the opening for the Belgrade-Constantinople Railway, the one opportunity which nature has conceded. It is the great objective of German aggression, if not the chief cause of the war. Without it the iron chain which was to unite Berlin and the Far East was incomplete; but it must not be overlooked that the progress of the war has opened up new possibilities for the alignment of this highway, and that Western Rumania becomes important in this connection.

The one great and most obvious defect in this scheme of Jugo-Slav federation is that there is no seaport on the south for Serbia. In the north there would possibly be access to the port of Fiume, but the central and southern provinces, cut off from the Adriatic by Dinaric, Montenegrin, and Albanian mountains offering no present facilities for connection with the coast, would be reduced to Danubian transport ending in the Black Sea and the Dardanelles, or be subject to the humiliating necessity of making use of a foreign port. This has ever been Serbia's grievance and it is most undoubtedly a sound one, if we admit the right of every country to occupy a geographical position which renders it self-contained and independent in the control of its own economic development.

There is a curious geographical analogy between Serbia and Poland in this matter. Poland also desires a seaport of her own in the Baltic. It is as essential to the development of Polish industries on the Vistula as it is to the development of enterprise on the Vardar. Poland, however, has none of the great natural advantages of Serbia in the strength and security of her boundaries. The frontiers of Poland are defined by rivers and swamps, and no political juggling whatsoever will ever make of that slice of the vast undulating plain of mid-Europe anything better than an independent buffer-land maintained as a safeguard from aggression between Russia and Germany. Nevertheless in this historical cockpit of Europe is a virile race of people, strong in their noble aspirations after freedom and their sturdy patriotism, who are concentrated more or less

in the whole valley of the Vistula from the Carpathians to the Baltic, a people of infinite capability, who desire a useful geographical environment in which to expand their trade and enterprise. For that they claim their own seaport as Serbia claims hers. Geography, apart from political considerations with which we have nothing to do here, demands that the new Poland should extend to the Baltic and the new Serbia to Salonika; and it may be asserted confidently that neither country will be happy until this reasonable aspiration is attained. The difficulty of such an allotment of territory is that an awkward slice of East Prussia in one case and of Greece in the other would be severed from the main body. But this difficulty hardly appears to be insuperable. German communication with Königsberg would hardly be affected by Polish occupation of Dantzig, and the Baltic sea route is always open. The difficulty on the Ægean front could be met by including the basins of the Struma and Mesta in either Serbian or Bulgarian territory.

This raises the next geographical problem, of territorial compensation to Greece. It cannot be overlooked that Greece with her overlook of the Eastern Mediterranean may be much more important in the future to the stability of our position in Egypt and our possession of the Egyptian route to India than she has ever been in the past. Problems of great complexity are clearly arising connected with air and sea power; and coast-lines in particular will have new values in sea strategy. Greece has a marvellous coast-line, not distinguished by many first-class ports and harbours, but by absolutely unbounded opportunity for the development of the submarine arm in sea warfare. To what extent the ragged outlines of Greek coasts have contributed to a disastrous curtailment of Mediterranean traffic and transport during the war we cannot tell; but clearly this geographical feature has to be reckoned with hereafter. If Greece is to be satisfied, what compensation will satisfy her? If she resigns her claim to a large slice of Macedonia, where else has Greece ethnographical claims which might equal or exceed her very doubtful claim to precedence there? Greece possesses and has possessed for centuries important colonies on the western shores of the Black Sea, and although those colonies are to be found in perhaps their greatest strength on the Bulgarian frontier at Varna and Burgas, there is still the world-old sentiment alive which attaches the Greek name to the first colonial and commercial ventures in the East which were bred in the atmosphere of the Euxine. Greece might relieve Turkey of the province of Adrianople and again assert her claim as a maritime nation to the use of the Black Sea. By general consent the impossible Turk is counselled in his own best interests to retire from Europe and to take refuge in Anatolia. He is an undoubted anachronism, in spite of many superficial virtues of a social order which win him the friendship of Europeans. Constantinople balanced between Greece in Europe and Turkey in Asia must never pass permanently into alien hands. German domination must be rendered impossible, or it

would still mean the direst trouble in the future, and thus a Serbian port on the Ægean and the disposal of Turkey are perhaps the greatest of all those geographical problems which the war has to offer.

It is, however, premature to deal with such grave questions as territorial redistribution; and we may well make use of our time in examining the geographical details which beset the frontiers of these many Balkan States, if we wish to take any intelligent interest in that final settlement which should bring with it the surety of future peace, based on the contentment of the peoples concerned with their geographical outlook and environment.

We have said nothing about Bulgaria or Rumania for want of time. Shortly, we owe nothing to Bulgaria; but nevertheless a Bulgaria suffering under the sense of wrongs, as Bulgaria was undoubtedly suffering at the outbreak of the war, would be a dangerous entity in the comity of Balkan States. Bulgarian arms reduced European Turkey to its present narrow limits and drew the line uncommonly near to Constantinople; and Bulgaria has always maintained that the province of Adrianople, and the Dobrudja with the command of the Danube exits to the Black Sea, were stolen from her as the penalty of exhaustion and weakness after her defeat by Serbia and Greece combined. She will be little inclined to surrender territory to Serbia. Therein lies one thorny geographical problem to be grasped, and the solution of it depends on after-war conditions.

Another lies in Rumanian aspirations. Rumania seeks expansion westward across the Carpathians into Transylvania, where is the ancient home of those Roman colonials who were introduced by the Emperor Trajan into Dacia after his conquest in the Balkan provinces. It seems to be clear on historical evidence that the upland valleys of Transylvania spreading westward from the Carpathians were held by the remnants of those colonists against the invading tide of Huns, and that from Transylvania they spread into Wallachia and Moldavia. Thus there is strong national sentiment at the back of the claim to Transylvania irrespective of the earnest desire of the Transylvanian Rumanian to escape from the thraldom of the Magyar. But Rumanian aspirations are not directed only westward. The Bessarabian grievance is as old as the Russo-Turkish war, for it was at the conclusion of that war that Bessarabia was absorbed into the Russian Empire, and that Rumania thus lost control of one million of her people. What she gained in the Dobrudja was no adequate equivalent for what was lost in Bessarabia. The Dobrudja position was improved at the close of the last Balkan war at the expense of Bulgaria, and Rumania holds (or held till lately) all the delta of the Danube and navigable channels to the Black Sea; but the Dobrudja boundary from the Danube to the Black Sea has ever been an exceptionally weak point in Rumania's armour of defence.

Rumanian claims can best be illustrated by a map taken from Rumanian sources. You will perceive that the net result of the realization of those

claims would be to render her geographically compact, her frontiers marching with Hungary, Galicia and Bulgaria, but with the capital Bucharest, the centre of administration, nowhere near the centre of the dominion. The realization of the Rumanian dream would about double the extent of her territories, and it would rather shorten her over-long boundaries than otherwise. Nevertheless, the western boundary would be shifted from a strong position based on the Carpathian ridges to a weak one east of the Theiss, traversed by at least eight considerable rivers north of the Danube, and affording little opportunity for sound defensive tactics. The Magyar menace on the west would not cease to exist, and would be accentuated by the Magyar occupation of a large block of territory just within the Carpathian bend. On the east of Rumania there is not much to choose between one river boundary and another, between the Pruth and the Dniester, so that the acquisition of Bessarabia would add ethnical strength without weakening the geographical issues. We must not overlook the remarkable progress made in Rumanian financial and material developments during the forty-eight years' rule of the Hohenzollern Prince Charles. Rumania may be said to have risen to the position of the leading Balkan State towards the end of last century. It is for us to see that she loses nothing by renouncing Hohenzollern allegiance.

To close this imperfect review of the many geographical war problems which beset this hotbed of disorder in the Near East, I may venture to point out those which I believe to be of paramount importance. First and foremost is the support of the Jugo-Slav federation on a basis which will render her geographical anatomy complete in the interests of all economic developments internally. She must have her own seaport, and she must continue to safeguard the approaches from Central Europe to Constantinople. The disappearance of Turkey from Europe (which by no means implies the removal of the Turk, who will accept any change of government with a pious reference to Allah and to fate, and stay where he may happen to be) seems to promise opportunity for compensation to Greece for what she resigns of the cosmopolitan province of Macedonia to the New Serbia. Whether Rumania will recover Transylvania, or whether Russia will be content that Bessarabia should be annexed to Rumania, so greatly depend on political issues at the close of the war that the geographical aspect of the problem is comparatively unimportant. I can illustrate only that aspect as I believe it to exist.

Before the paper the PRESIDENT said: It falls to me to introduce myself. I have undertaken to read a paper to-night which is, I am afraid, rather superficial, for it has had to be prepared in a hurry. I must ask for your kind consideration.

(*The President then read the paper printed above, and a discussion followed.*)

Viscount BRYCE: The President has carried us over so very wide a field in his most instructive and stimulating lecture that it would be impossible to

do more in responding to his call than to make a few scattered remarks as to some of the numerous topics upon which he has touched. I should feel very much afraid to venture upon the ground of strategy, especially after the warning he has given us that the use of submarine and aerial warfare has given quite a new aspect to questions of frontier strategy and of naval as well as military war. It would be also dangerous for any one to touch the topic to which he cautiously adverted of settlement of the boundaries of the different Balkan States, because, as you know, the feelings of the different Balkan nationalities towards one another are marked by considerable bitterness, and I have noticed, as probably most of you have, that all these States have partisans in this country, and that partisanship in this country as to the respective merits and claims of each of these States is almost as keen as are the passions of the several Balkan races. Therefore anything I could say here which might be supposed to be an encouragement of either Hellenic or Rumanian or Serbian or Montenegrin or Bulgarian or Albanian claims might incur the wrath of at least five of the six nationalities. I think it will be better, therefore, for those of us who venture to follow the President to keep upon the safer ground of commercial exits and of mountain lines to which he devoted so large a part of his very opportune remarks. He dwelt, and with great force and truth if I may presume to say so, upon the dominant feature of the whole Balkan Peninsula, namely, that its rivers do not run the right way. Its great streams, the Danube and the Save and the other western tributaries of the Danube, the Morava and others, all go into the Black Sea; and the Black Sea, unfortunately, is separated from the Mediterranean by the two narrow channels which have given, and are destined to give, so much trouble to statesmen and diplomatists, those of the Bosphorus and the Hellespont. The right thing would have been that, instead of that tremendous barrier of the Julian and Dinaric Alps running along the coast of the Adriatic, there should have been broad open valleys down which streams would flow southward and westward into the Adriatic; and that other streams further south should have flowed from Eastern Bulgaria across Macedonia into the Adriatic at its southern end, where it opens into the Mediterranean. Had that been the case, the lines of settlement would probably have followed the river-valleys. You would have had diverse nationalities, but there might have been fewer conflicts between those who own the coast and those who dwell on the hinterland than the conflicts which we see to-day. The only gap of any importance in the line of the Dinaric Alps is that through which the river Narenta descends a little north of Ragusa. Further south the Drin comes into the Adriatic a little to the south of Skodra (Scutari). Both of these pass through narrow exits, the northern very narrow indeed. The consequence is Serbia has been cut off from the Adriatic coast. If you take the voyage from Trieste down to Cattaro—and you cannot take a more interesting or beautiful voyage—you will be struck the whole way by this tremendous barrier of lofty mountains rising almost immediately from the sea, and with no large streams coming down from them except at one point. Curiously enough, at the base of the mountains one sees the subterranean discharge of the rains which have fallen on the other side of the mountains, and which have passed through immense limestone caverns before emerging close to the edge of the sea. At one spot a vast fountain comes out like a full streaming river suddenly arising out of the earth and flows in 100 yards down to the sea, which is very little lower. A more beautiful object than this great fountain of pure water rising from among the rocks can hardly be imagined. This isolation of Serbia and Bosnia from

the Adriatic is the real difficulty in the position of those countries. Although there was some little amount of suspicion and jealousy between the Serbs and the Italians at the beginning of the war over Dalmatia and its islands, there is now a prospect that when the war is over the Italians will find no difficulty in obtaining certain strategic points along the Adriatic where their fleet can have stations to give them safety in that sea, while at the same time the greater part of the coast will be allowed to go to the Serbs, to whom it belongs by race. There are, of course, cities like Zara and Sebenico where Italian is very largely spoken, but the country behind is practically all Serbian. I suppose that upon that basis arrangements could be made; and clearly Serbia would be well entitled to have the most complete assurances for effective communication to the sea from her inland territory down to the coast of the Adriatic. There cannot be a better founded claim, and Serbia will gain by the opening for her commerce and opportunities to develop her natural resources. That really would be more profitable to Serbia and more easily obtained politically than the extension of her territory down to Salonika, because it would give her a far better access to the Western Mediterranean instead of requiring her commerce to take the long and in winter and spring very stormy voyage down through the Ægean Sea, where the north-east wind blows with great violence through many months of the year, as the Greeks knew to their cost when they could not succeed in getting away from Aulis to Troy. The access to the commerce of the West would be really better through the Adriatic than down the coast of Greece. As regards the question of nationalities generally: the President observed with truth that unless you have travelled in these Balkan countries it is extremely difficult to realize the way in which different races are intermingled, and you cannot get an arrangement which would be satisfactory to all. In Bohemia, for instance, although it is generally true that there is a German ring along the north and west of Bohemia, the Czechs are mixed with Germans in many other places, and in Transylvania the three elements, Ruman, German, or as they call it Saxon, and Magyar, are so mixed that you could not give the country to any one of these three without a great deal of injustice to the rest. The Rumans, no doubt, especially in Eastern and Southern Transylvania, are the predominant element; but at the same time there are so many Magyars, especially Szekler Magyars in some places and so many Saxons in others, that the other two nationalities would put forward considerable grounds of complaint. Extremely careful arrangements will be needed for protecting smaller nationalities from arbitrary rule on the part of the larger nationalities to which any territory may be assigned. That is the difficulty you get as soon as ever you go far eastward in Europe. When one gets beyond Vienna mixed populations are found where it is almost impossible to make any arrangement which would be really satisfactory. In some cases the trouble is aggravated by differences of religion, not merely by differences of religion between Christians and Moslems as in the Turkish dominions, but also as between the Orthodox and the Roman Church, whose antagonisms in times past have been very bitter, although there they are now being happily appeased. There are a great many other points upon which the President spoke, and to only one of which I must attempt to refer: the scenery of Rhodope. There is the famous Bulgarian monastery of Rilo to the south-east of Sofia, not very far from the Bulgarian town of Samakov, lying in a lovely valley. You can imagine no more lovely mountain and forest scenery than one finds in the valleys which surround this monastery. The President made a few remarks about our old friend the Turk. He said he is an anachronism

in Europe. May I add to that that he is an anachronism everywhere? The Turk has made himself impossible. He is not fit to rule over any people of a different race. As a private individual he has some virtues, but as a ruler he is impossible. Instead of being satisfied with turning him as a ruler out of Europe, we should turn him out of any region where he can oppress Christian subjects. There are parts of the interior of Asia Minor where the population is mainly Moslem, and where there are comparatively few Christians to be massacred or tortured, and in those places a weak Turkish Sultan may be tolerated. The Seljuk Turks for a long time held rule in Konia, and if it is desired to keep a Sultanate going a Turkish Sultan might be planted at Konia, where he would do no harm and probably become a respectable member of society. Thus we should get rid of any power he might exercise over the Christians of Armenia to the east or over the Greeks on the west coast, or over the Christians and Moslem Arabs of Syria in the south, in which regions he has been signalizing himself by perpetrating shocking massacres. There is no happier or more peaceful part of the Mediterranean shore, nowhere have people lived with more comfort and happiness than in the Lebanon, for although it was nominally part of the Turkish Empire, it was under an administration in which the Turks did not take an active part. But as soon as the war broke out the Turks entered the Lebanon, they cut down trees, destroyed villages, beggared and murdered the people, so that over large districts few people were left alive. When I saw it four years ago it was the most prosperous and tranquil part of the Near East. These regions must be liberated for ever from the domination of the Turk, and I am glad to see in that connection that His Majesty's Government has recently expressed its sympathy with the idea of allowing Jewish communities to be settled in Palestine. They might restore prosperity to that country, which has also languished so long under the rule of the Sultan. I should like, if I may, to be permitted to express, on behalf of those of us who are endeavouring to feel our way on Balkan and Eastern questions and have realized how difficult it is to discover satisfactory solutions, the obligations we are under to you, Mr. President, for the light which you have been kind enough to give us to-night.

STUDY OF A DUNE BELT

W. J. Harding King

MOST striking features of the Libyan Desert are the curious long, narrow dune belts running across the desert, roughly from north to south, in almost straight lines. The Abu Moharik belt, which is one of the most conspicuous of these, has a length which cannot be much less than 400 miles; but though it varies somewhat in width the average breadth is probably not more than 5 miles, about an eightieth of the total length. These belts consist almost entirely of crescent-shaped dunes. In places these dunes are scattered and stand isolated from each other, with areas of sand-free desert between them. In other parts the dunes are more closely packed; many of the crescents join together to form large clusters; and the spaces between the dunes are also sometimes covered with sand.

At one point the Abu Moharik belt is crossed by the Western Oasis Railway which connects Kharga oasis with the Nile valley. I visited this place in several successive years, and generally stayed there for a day or two when I did so, in order to study the dunes. During two winters I was camped near the railway for several weeks, and the second year surveyed the dunes on both sides of the line. At this part of the belt the dunes were at about their average density, and, as the desert between them was free from drift-sand, the exact boundary of the dunes themselves could generally be easily ascertained, which would not have been the case had they been lying on sand. Where the exact limit of a dune could be seen, it is shown on the plan as a continuous line. In some places however, owing generally to the roughness of the ground, the precise edge of the dunes was not very apparent: these parts are not outlined.

The plan of the dunes was made with a steel tape and prismatic compass. Whenever possible the traverses were made so as to close on their starting-points or on points in traverses previously made in this way; they were then adjusted by the ordinary graphic process. Rectangular offsets were made from this framework of traverses to points on the edges of the dunes. In the case of the smaller traverses—such, for instance, as the one round the dunes 18 and 19—the closing error was hardly plotable. The maximum error was in the traverse round the big central dune-cluster lying just to the north of the railway, when some difficult ground had to be crossed to the south of the hill 7; the closing error in this case was just over 20 metres.

Some sections of the dunes were also made, with an ordinary service clinometer and a levelling staff which I made myself out of a deal board graduated in pencil by means of the steel tape. As the points fixed in this way were very close together, and the observations were always taken more than once, the inaccuracy of a clinometer as compared with a spirit-level was not of much consequence—especially as the clinometer did not require a tripod, which would have been very difficult to set up rigidly on the yielding sand.

The belt at this point is unusually narrow. Its whole width is shown at the point where the railway crosses it. Further to the north, however, it was nearly double as wide, as the north-eastern portion covered by the plan—the top right-hand corner—contained some fairly large dunes forming a continuation to the east of the northernmost cluster, and there were also some other dunes lying to the south of them which came down to about the level of the hill 7. But as these lay in very broken ground a survey of them would have been useless. Mr. Beadnell found as a result of the valuable weather observations made by him in the oasis of Kharga,* that on five days out of six, when the wind was blowing with sufficient force to move the sand, its direction was from the north, and that by far

* "The Sand Dunes of the Libyan Desert," by H. J. Ll. Beadnell, *Geog. Journ.*, vol. 35, p. 383.

the greater number of sandstorms were from the same quarter. The belt at this point consequently runs nearly due north and south. The portion

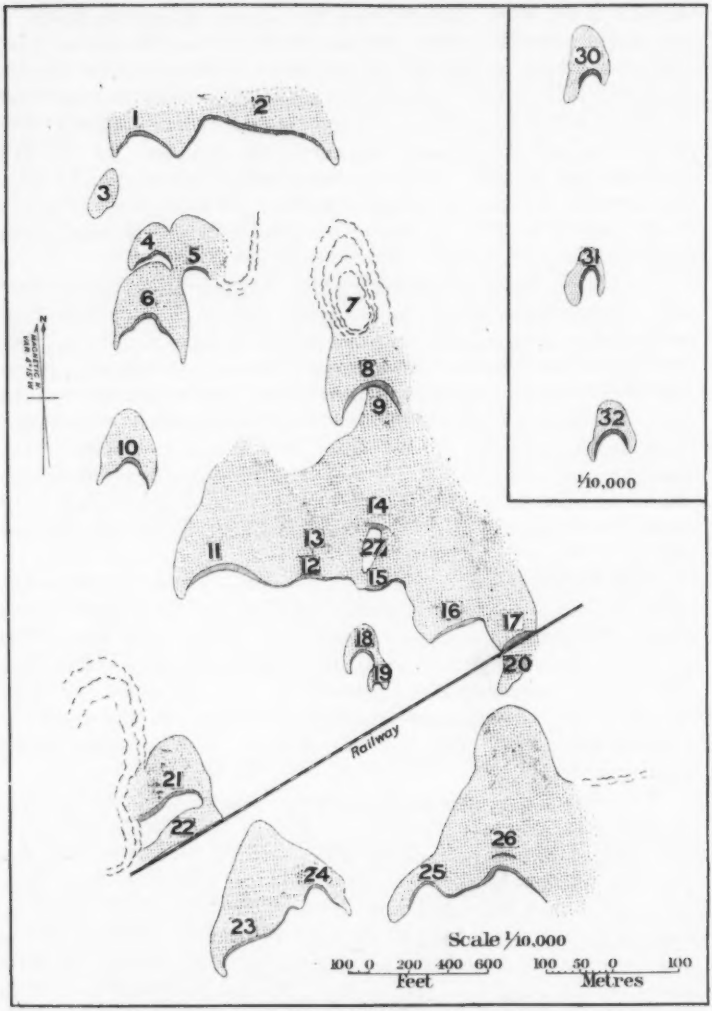


Fig. 1.—Plan of Dunes in the Abu Moharik belt, Libyan Desert

surveyed consisted of three large nearly equidistant clusters, with smaller dunes and dune-clusters scattered about between them. I have treated the dunes 23, 24, 25 and 26 as one group, because on level ground I think

the two compound dunes 23, 24 and 25, 26 would have combined. A low ridge, however, which lay between them probably prevented their doing so.

The smaller dunes can be divided into three classes. First there is the isolated horseshoe or crescent type, such as 10; then there are the small dune-clusters where a second horseshoe dune adheres to one of the horns of another crescent, such as in groups 18, 19 and 21, 22. The third type is the over whale-backed dune 3. This is the only dune of this class that appears on the plan, though another of the same kind lay on very sloping ground to the south of the western horn of the dune 23. It will be noticed that all these three types of dunes lie to the south—that is to say to the lee—of the horns of other crescents, which are usually larger than themselves. The dune 3, for instance, has formed off the western horn of 1; 4, 5, 6 and 10 off its eastern horn; 21 and 22 off the western horn of 11; while 18 and 19 lie just to the south of the low neck that divides the western side of the small dune 15 from the eastern flank of the much larger one 13.

The hollow 27 was a bare patch of desert lying under the lea of the large dune 14. It was bounded on the west by the flank of 13 and on the east by the dunes 15 and 16, which at the time the survey was made merged imperceptibly into each other.

The dune 20 need not be considered as, though it had to some extent assumed the shape of a dune, under the action of the wind, it was in a sense artificial, as the sand of which it was composed had been thrown over the line by the draught screen placed at this point to prevent the dune 17 from encroaching on the rails.

The position that these small dunes and clusters occupy in the plan is, I think, significant. When the wind blows over a crescentric dune it invariably shows a tendency to contour round its slopes instead of blowing in a straight line over the top; consequently, when the normal, northerly, wind is blowing over these crescents a considerable stream of sand is continually flowing to leeward past their horns, and in the cases where they have combined to form a group, over the cols formed at the junction of the flanks of two adjacent dunes of the cluster. When standing on the top of one of these dunes during a sandstorm I have often seen small sand-laden eddies with a vertical axis—miniature "sand-devils," in fact—forming and reforming over an area lying to leeward of one of its horns. These eddies are caused, I think, by the obstruction that the dune offers to the passage of the wind, and closely resemble the very similar eddies to be seen in water on the down-stream side of the pier of a bridge past which a rapid river is flowing. When these eddies break up they must drop the sand they are carrying, and since they keep on forming and breaking up over the same area, a considerable amount of sand must be deposited by them during a single sandstorm. If the point where the sand is deposited is slightly sheltered from the wind, enough sand may collect there to cover

the ground to a sufficient depth to allow it to ripple, and when once the rippling has been formed other sand-grains blowing over the surface will get caught in the troughs of the ripples, and the heap of sand thus collected will continue to increase in size and height until it develops into a whale-backed dune.

In one place I found no less than three small whale-backed dunes lying in a line up and down wind, in a manner that suggested the probability of recurring eddies. A fourth dune seemed to be forming at the end of the string. The obstruction that set up the eddies in this case was apparently the shoulder of a small ridge that jutted out from a long north and south hill which lay to the west of the dunes.

These whale-backed dunes in course of time develop mostly into dunes of the crescentic type. But in order to deal with this development it is necessary to consider their exact shape. Fig. 2 shows a cross-section of the whale-backed dune 3 taken from east to west. There was a difference in level between the two ends of the section, which is shown at the break in the base line. This cross-section was made some time after I took those that ran up and down wind. The latter were taken after a gale from the prevailing direction, but unfortunately in the interval between the two surveys a rather strong wind from the west blew for a couple of days which has given the dune a rather lopsided cross-section.

These sections are not strictly speaking curves, but are formed by a series of short straight lines joining the points that were actually fixed, as indicated by heavy dots on the sections. The dotted curves are those which the sections seem most closely to resemble. The curve for comparison with the cross-section is an ordinary camber, constructed on a base line consisting of the western part of the base shown in the section, produced till it met the downward continuation of the curve of the dune on the east, as shown by the dotted line. A camber can be constructed by erecting a perpendicular CD at the centre of its base AB, joining AC, and producing it to meet BE, erected perpendicularly to one end of the base AB, and dividing BE and BD into the same number of equal parts. The intersection of lines drawn from A to these divisions on BE with perpendiculars from the corresponding divisions of BD give points in the curve. [It is easy to show that the camber thus described is part of a parabola.—Ed. *J.G.*]

Fig. 2 shows also in two parts the section of this dune—taken in the direction of the prevailing north wind—over its longest diameter; there was again a slight difference, shown in the base line, between the level of the ground at the two ends of the section. But as the direction of the wind could not possibly have been affected by the shape of the land lying below the sand, I do not think that this difference in level can have had any effect upon the character of the curves, though it of course produced a slight alteration in their proportions. This section shows very clearly the great length of this type of dune in proportion to its height.

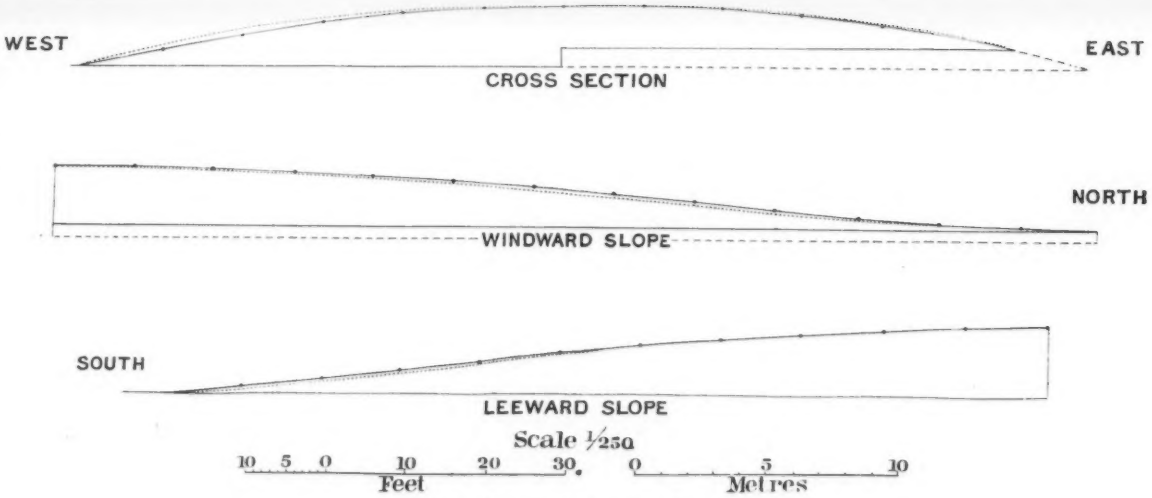


Fig. 2.—Sections of whale-back Dune 3

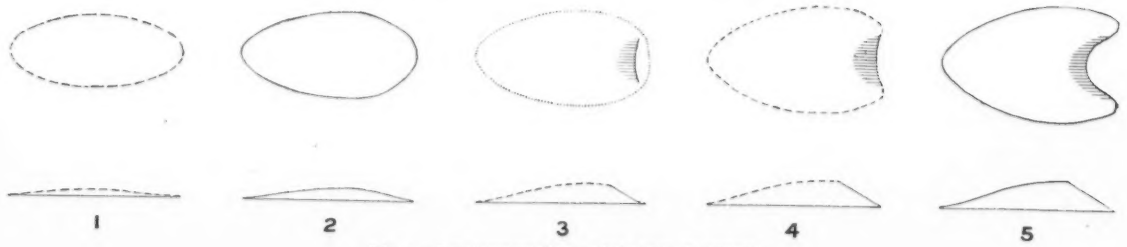


Fig. 4.—Development from whale back to crescent

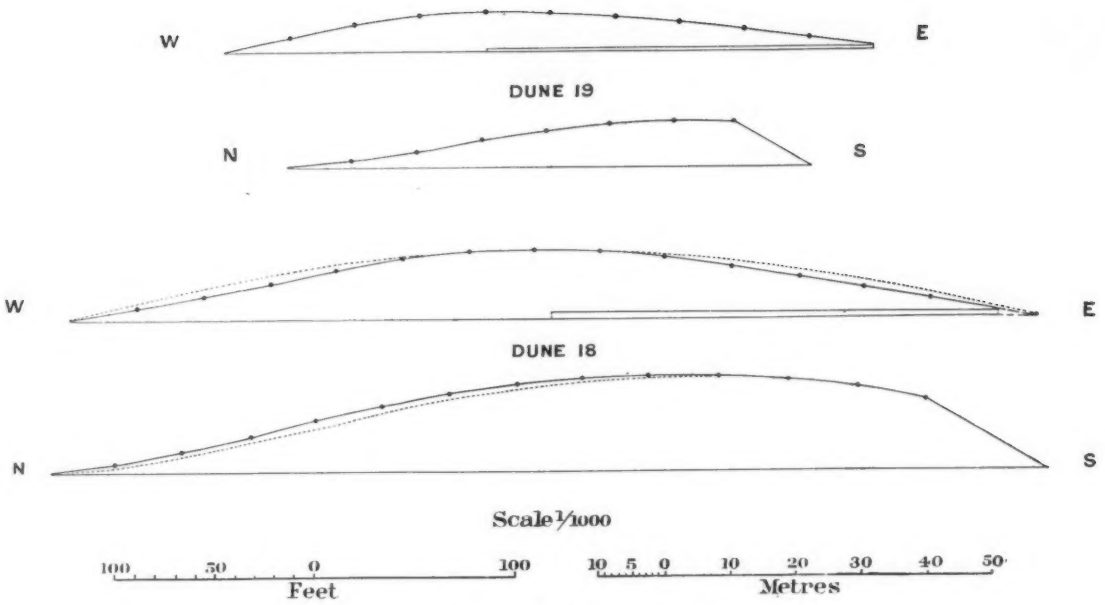


Fig. 3.—Sections of Dunes 18 and 19

The dotted curve is a cycloidal curve of the same proportions. For practical purposes this may, I think, be taken as the shape of the dune. I say "for practical purposes," because in addition to any abstract scientific value of data of this kind, they have a considerable practical value as well, for when once the curves of these dunes are known, their cubic contents can be easily calculated—a question of some importance when it has, for instance, to be decided whether a dune shall be carted away in order to prevent it from encroaching, or whether some other method of dealing with it shall be adopted.

The curve of the lee section I was unable to identify; but its nature can be gathered from the heights of the section taken at tenths of its length. Putting the extreme height as unity, the others were as follows :—

1 = 1·00	6 = 0·66
2 = 0·99	7 = 0·53
3 = 0·93	8 = 0·39
4 = 0·85	9 = 0·24
5 = 0·76	10 = 0·12

The windward curve of the whale-backed dune, as it increases in height in process of development into the crescent shape, somewhat changes its character, becoming rather more "hump-backed" than in its initial stages. This can be seen in Fig. 3, which shows a section taken up and down wind of the dune 18. The dotted curve is here the same cycloidal curve with which the windward section of the whale-backed dune 3 was compared.

Before discussing the development of the lee curve of the whale-backed form it is necessary to consider the rather vexed question of the formation of the flat face, or "slipping cliff," as Dr. Cornish calls it, that is so often to be seen on the lee side of a dune. Dr. Cornish's theory is that this lee face is formed by a "back-acting eddy" that erodes the down-wind side of a dune. His views on the subject of these eddies are given in a diagram in his paper, "On the Formation of Sand Dunes" (*Geographical Journal*, vol. 9, p. 298), in which an obstruction such as a wall is shown with the wind blowing from the left at right angles to its face. He believes that under these circumstances there is an eddy on either side of the wall that revolves in the direction of the hands of a watch, and as a considerable part of his theory of sand-dunes is based upon the existence of these eddies, it is necessary to examine them rather carefully.

For my part I do not think that either of these eddies exists, except perhaps in the shape of a very occasional flaw—that is to say, a temporary gust of wind that has no appreciable effect upon the shaping of the dunes. Take first the eddy on the windward side of the obstruction. I once made some experiments with ordinary smoke rockets, allowing their smoke to be carried over the top of the wall by a high wind blowing practically

at right angles to it. I could see no trace of this eddy. The smoke was carried up from the ground-level, as shown in a photograph, to the top of the wall in a curve with its concave side to the direction of the wind, and though I burnt several rockets to thoroughly test the point, there appeared to be no tendency to eddy at all. The smoke rose from the ground-level to the top of the wall slowly, as compared with the velocity of the wind in the open, showing a certain amount of stagnation in the air near the base of the wall. Once, however, it had reached the top it was whirled so rapidly away to leeward and became so dispersed that photographs taken on the lee side of the wall did not show enough smoke to enable the course of the wind to be determined, and I was obliged to repeat the experiment on a small scale by allowing the smoke to drift over a plank about a foot wide, in order to obtain the necessary data from the photographs. Here again the photograph showed no sign of an eddy.

Apart from these smoke experiments, the existence of an eddy such as Dr. Cornish describes under the lee of an obstruction is, I think, quite contrary to all experience. If a man is standing with his back against a wall, say 10 feet high, when the wind is blowing at right angles to the other side of it, it is a well-known fact that he is "in the lee" of the wall, or in other words that he is out of the wind. Probably the eddies under the lee of an obstruction of the shape of a dune would differ somewhat from those in the lee of a wall, but so far as I have seen a back-acting eddy does not form there. I spent some weeks camped on the lee side of a barchane in a tent the back of which was within a few feet of the foot of the dune. During an ordinary wind from the normal direction the tent was completely sheltered. When a sandstorm, however, was blowing flaws of wind occasionally struck down from the north on to the roof of the tent with considerable violence; but though I was all the time on the look-out for eddies from an abnormal direction, I do not remember having seen one blow directly into the door of the tent; it was however not uncommon for them to come into it diagonally from the direction of the horns of the crescent.

Perhaps Dr. Cornish may have been misled in this respect by Darwin's theory of the small eddies that form in the troughs of ripples under water, for I do not think it by any means follows, because eddies of this kind may exist, an inch or so in diameter, in an inelastic and comparatively viscous medium like water, that similar eddies will be found in an infinitely more elastic and less viscous medium like air, and on a very much larger scale. An eddy occupying the trough of really large dunes might easily be 200 yards in diameter. If such an eddy as Dr. Cornish supposes existed, and it was of sufficient force to have any influence at all in modelling the dunes, the first evidence of its presence would obviously be on the rippling. The rippling on the lower part of the windward slope would be reversed. Personally I have never seen rippling of this description after a normal wind had been blowing. I have always found that the rippling at the

lower windward end of a dune that was not peaked faced in the same direction as it did at the top, and in the case of very low dunes, like the whale-backed one that I have described, the rippling forms a continuous series from the windward end over the summit and down the leeward slope to the very bottom, clearly showing that the wind follows closely the curve of the dune from one end to the other. In the case of a peaked dune the wind tends to follow the contours.

I believe that when the wind passes over, say, a wall at right angles to it, it sweeps on the windward side upwards towards the top in a curve such as I have photographed, the lower layers to some extent forcing up those that overlie them, and probably producing some degree of compression on the top of the wall. Beyond the obstruction the wind sweeps on in a downward curve, and eventually strikes the ground with considerable force at some distance to leeward. This down-draught of the wind, which is perhaps the result of the re-expansion of the compressed air, has probably a considerable effect in eroding the troughs of parallel systems of dunes. Below the layer of the wind on the lee side of the obstacle there is a space, roughly triangular in shape, of practically stagnant air, which however during a high wind is occasionally disturbed by small flaws. Between this triangular space and the current of air flowing over it small eddies a few inches in diameter frequently form during a gale.

These eddies, it is true, have a horizontal axis like those in Dr. Cornish's theory; but they do not, I think, play the part that he assigns to them. As a rule they form at some distance from the face of the dune and are much too small to reach the ground. Even if they did so they would, I think, have no effect upon the sand, as they revolve in the manner of the wheel of a moving cart; consequently while the circumference of the eddy is spinning round its axis, the axis itself is carried down wind; so the lower edge of the eddy, which would be the one to affect the dune, is stationary, or practically so, relative to the ground, and has not the necessary velocity to set the sand in motion. I do not think that the slipping face on a dune is in any way due to an eddy, but that it follows necessarily from the character of the curve into which the wind shapes the dune and from the nature of the sand itself.

The process of the development of a whale-backed dune into a crescent can be divided into certain definite steps. The stages shown in the diagram with a continuous line are based upon actual surveys; those with a broken line on dunes which I have seen, but not surveyed; while the dotted line shows a theoretical form (Fig. 4).

In the first of these stages the highest point of the dune is near its centre, and if it is lying on a horizontal even surface, the ground plan, I believe, would be approximately that of an ellipse.

The second stage is reached when the summit of the dune gets pushed further down wind; this I think produces a corresponding change in the ground plan. In these whalebacks and crescents the cross-section that

has the longest base passes through the summit of the dune, and consequently the dune's greatest width—taken across the wind—travels down wind at the same speed as the highest point. The elliptical ground plan consequently assumes a pear-shape, with its maximum breadth towards the leeward end.

I am not sure whether the character of the lee curve of a whale-backed dune remains the same, as the ratio of height to base alters during its development into a crescent. I think it is more probable that it undergoes a change somewhat similar to that of the windward curve. But for our purpose the question is not one of great importance, in view of the fact that it certainly remains of an ogee character—that is to say, that it is a compound curve composed of a convex section on the top of the dune merging into a concave one at its foot. In all curves of this description it will, I think, be found that as the base of the curve decreases in length in proportion to its height, sooner or later a stage is reached when a portion of the curve, near the junction of the concave and convex sections, exceeds the angle of rest of dry sand—which is approximately 30° to the horizontal; and then the sand at that point slips down to form the flat face on the lee side of the dune.

The section Fig. 3 of the whale-backed dune 18 shows that for a dune of this shape the leeward slope reaches the angle of rest of sand when the length of the base is about $2\frac{1}{3}$ times the height of the dune.

The flat lee face at first does not extend to the ground-level: it cuts back into the convex curve at the top of the lee side of the dune and buries a part of the concave curve at its base, but leaves the remainder of it as a sort of "apron" at its foot as in Fig. 4 (3). This is the third stage in the development of the crescent. Dunes in this condition are not often seen, as this stage is of short duration. As the sand is blown up the windward slope of the dune over the summit it falls in successive layers on the flat face, which consequently advances down wind and soon covers over the small "apron" of sand at its foot. The lee face then reaches down to ground-level and the dune has reached its fourth stage.

When in this condition the ground plan of the dune on its lee side is only slightly concave and the dune cannot be said to have assumed the true crescentic form. The tendency, however, of the wind to contour round a crescent dune, combined with the increase of density in the flying sand near the ground during a sandstorm and the greater rapidity with which the lower parts of the flat face at its ends advance, as compared with the higher central portion, cause the two ends of the lee face to advance down wind more rapidly than the centre and to form the two horns of the crescent—this forms the fifth stage, and the dune is now what I believe to be usually considered a typical crescent. For convenience of comparison, I have shown all the sections and plans in the diagram as being of the same length, but in most cases there would be a change in the length of the dunes during the process of development.

Besides the simple crescent there are other types of dunes which are to be seen in this belt, but which I believe to be more or less abnormal forms. One of the commonest of these has the curious cusped form of ground plan on the interior of the crescent. This is very apparent in the dunes 6 and 10; it is, I believe, produced by a wind which, after following round the lower flanks of the dune, sweeps into the lee side of the crescent in large vertical eddies that erode the inner side of the horns of the crescent.

On the larger dunes it is not unusual to find the upper part of their lee-slopes broken up by small slipping cliffs that are quite distinct from the main flat face lower down; these small facets I believe to be the result of

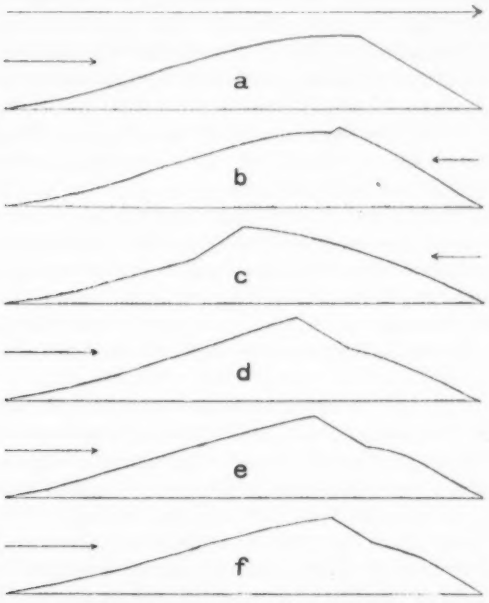


Fig. 5.—Effects of reversal of wind on section of a Dune

violent gales that blow from the opposite direction to that of the prevailing wind.

The first effect produced by a wind of this kind is to deposit (as shown in Fig. 5, *b*) a small mound or ridge of sand at the top of the lee face—using the term "lee" with reference to the direction of the prevailing wind. The top of the dune is then "turned." If the wind continues to blow for a considerable time or with great violence it gradually begins to convert the flat lee-face into the cycloidal or windward curve, and the dune then presents the section shown in Fig. 5, *c*. Sections of this type with a low facet high up on the dune are, I believe, the permanent shapes of large dunes which are subject to two nearly equal winds blowing—as is the case at

El Wad in the south of Algeria—from approximately opposite directions at different times in the year. Where the effects of the two winds on the dunes nearly balance each other a large dune becomes practically stationary, or at most oscillates slightly to and fro over the same spot, with perhaps a slight tendency to creep forward under the influence of the stronger of the two winds.

In the case, however, of the smaller crescent dunes of this part of the Libyan Desert, though an unusually powerful gale from the south may temporarily convert them to this form, the northerly winds so greatly predominate that the top of the dune is very soon turned back again (as shown in section *d*) so as to face towards the south. For a time it then has a small flat facet high up near its summit. This facet is only a small one, and since the surface of the dune to leeward of it falls rapidly away towards the south, the prevailing wind carries a considerable amount of sand over the upper face and deposits it some distance away on a portion of the dune, near to the point where the top of the slipping cliff originally lay. This part of the dune is sheltered from the direct action of the wind; the sand consequently rapidly accumulates at this point (as shown in *e*) until it exceeds its angle of rest, when it slips down, the lower face is reformed, and we get the section shown in *f*. Nearly all the sand blown over a dune of this shape falls either on the upper facet or the portion of the dune at its foot—hardly any of it reaching the lower face. The upper facet consequently soon catches up the lower one, and the two then form a continuous surface and the dune has gone back to its original shape as shown in *a*.

In addition to their development from a whale-backed dune there are other ways in which these crescents are formed. Sometimes a small dune of this description will split off from the lee side of a large dune-cluster. Two years after I surveyed the dunes near the railway I visited the place again to see what changes had taken place in the sand. The small dune 15, lying to the south of the hollow 27 at the time of the survey, appeared to form an irregular part of the dune 16. Before my second visit however a deep col had developed between it and 16, and on the west it was completely detached, owing to the hollow having extended so far to the south as to cut entirely through the low neck of sand that formerly bounded it in this direction. The dune 15, being small, travelled more rapidly than its neighbours and had already advanced a considerable distance down the western flank of 16. The dune was so nearly detached from the main cluster of which it had originally formed part, that there is no doubt that after a few more weeks it would have become completely separated from it.

Another process by which crescent dunes are frequently formed is by development at the end of the horn of a larger one. An instance of this is seen in the case of 19 attached to the horn of 18. And another case appears in 22, which has developed off one of the horns of 21. The dune 22 appears

on the map to have been originally about the same size as its parent dune 21, but in reality it was much smaller and lower. It had, however, undergone a considerable lateral development owing to the fact that the railway at that point ran over a slight embankment against which the sand had accumulated. I saw the two dunes 18 and 19 in every stage of their development. My attention was first drawn to them by the native foreman in charge of this section of the line, who said that he thought that a new dune was forming. All that was to be seen of them at that time was an irregularly shaped patch of ground that seemed to be more thickly covered with sand than the desert immediately surrounding it. At that time I was on my way out to Dakhla oasis, so could not stay to wait for developments; but some months afterwards, when returning to the Nile Valley through Kharga oasis, I found that the level of the sand had risen considerably and that the ground plan of the dune was quite regular—in fact the irregular patch of sand-covered desert had become a very low but typical whale-backed dune. In the following year it became much higher and developed into a crescent: no sign, however, of the second dune was to be seen.

The next year was that in which it was surveyed, and it appeared as shown in the plan, with the smaller crescent attached to one of its horns. When I first saw it that year there was a very small third crescent attached to the neck of sand that joined the two dunes, the arrangement of this group of three dunes being then rather similar to that of the dunes 4, 5, and 6. This small dune can be seen in a photograph, but shortly after the view was taken it disappeared during a violent sandstorm and at the time of the survey no trace of it was to be seen. Two years later, when I next saw them, these dunes not only showed a marked increase in size, but the smaller dune had broken off from the larger and had passed completely over the rails, while the larger dune, which was lagging behind, in a few months would have come on to them.

I admit I am not quite certain how these adherent dunes are formed; but I think that possibly they originate in a pile of sand, deposited in the same way as the heap that produces a whale-backed dune, by an eddy formed off one of the horns of a crescent, which first reaches the rippled stage under the influence of a gale from a slightly abnormal direction, or say, to take the case of this dune belt in Kharga oasis, from the north-east. A heap of sand formed in that way would be situated between the horns of the crescent, instead of in line with one of them, and a very small low dune in this position would be practically unaffected by a wind from the prevailing northerly direction, as it would be sheltered by the larger dune. This large dune, however, would advance under the influence of this wind towards the smaller one.

Winds from the east and west would only cause it to oscillate slightly, though they might blow a detached dune, such as 3, formed off a horn of another, under the lee of the larger dune. Southerly winds however,

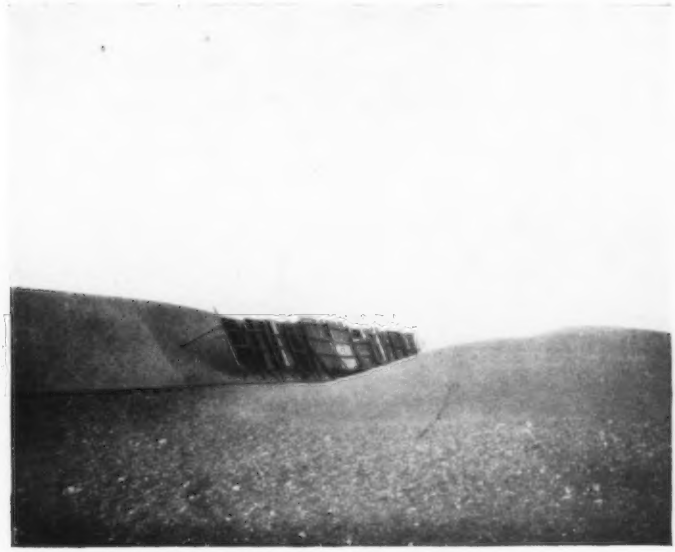
which sometimes blow with considerable force, would drive it back upon the larger and consequently slower-moving crescent lying to the north of it, so that both the normal and reverse winds would cause these two dunes to approach each other, until in course of time the two would meet and combine.

A marked peculiarity of these adherent dunes is the tendency they show to spread out in the direction of the second horn of the crescent to which they are attached. This is very noticeable in the case of 22. The cause of this is presumably that the flank of the adherent dune is to some extent sheltered on that side, and consequently is not so much eroded by the wind as the outer flank. It is noticeable too that the sheltered side of these dunes appears in a cross-section to be considerably higher than the outer flank. As the small attached dune increases in size it becomes less sheltered from the wind by the larger, and consequently is pushed more rapidly down wind, and finally breaks off from it altogether.

The greater part of the surface of all these dunes is composed of hard strongly crusted sand; but this caking of the surface is curiously local. In walking over the dune 23, for instance, my footprints usually only crushed the ripples, but here and there I found places where I sank suddenly in up to my ankles, though no indication of the absence of crust was to be seen on the surface until I actually trod upon it. The very local character of this caking of the sand can be gathered from the photograph, which shows two of these soft patches, the extent of which is shown by the deep footprints, the sand all round these patches being crusted quite hard. In the background of this photograph the dunes 21 and 22 can be seen. At one place on this same dune I not only broke through the crust as I walked over it into the soft sand below, but about a square foot of the surface of the dune suddenly fell into a hollow beneath when I trod on it, leaving a hole about a foot deep, into which the sand from the surface trickled down, cutting grooves in the perpendicular side of the hollow as it did so.

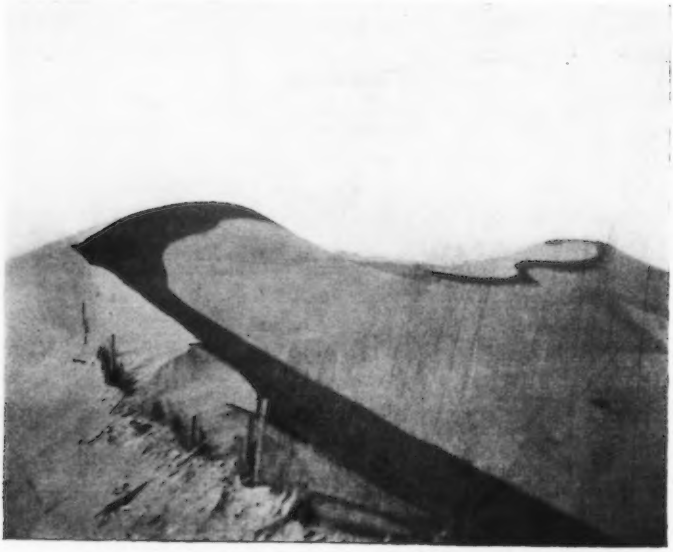
In many places the desert consists of stiff clay, which owing to the heat of the sun forms cracks, perhaps 10 feet deep and a foot or two across. Sometimes this clay is covered with sand heavily crusted on the surface. This type of desert is, I believe, known to the Bedouin as *Noser*. Often when crossing a patch of desert of this type one of my camels has stumbled, and when he moved on left a hole behind him 7 or 8 feet deep, showing that he had trodden on the sand-crust covering a fissure in the clay. A more uncomfortable surface to trot a camel over it is impossible to imagine. But though the presence of a crack of this kind in the clay will account for a hollow beneath the sand that covers it, I have been unable to see how it can exist in the mass of a sand-dune.

This crusting of the dunes undoubtedly sometimes has an effect upon their shape, though I do not think a very appreciable one. The dune 13 when viewed from below showed a distinct peak, quite different from the normal outline of a dune of this type. On climbing up on to the dune I



DRAUGHT SCREEN TO PROTECT RAILWAY

CAMP WITHIN CRESCENT DUNE 21 FROM S.S.E.



LARGE DUNE WITH TOP TURNED NEAR EL WAD SOUF

SOURCE OF DUNE BELT AT MOUTH OF GORGE

found that while the top of it, as a whole, was only very lightly crusted, there was a ridge of hard-caked sand running up and down wind, the southern end of which formed the peak that I had seen from below. This crusting was of very limited extent, as can be seen from the photograph of my tracks. On the top of the ridge the rippling only was trodden through; but on either side of it the footprints are of some inches in depth. This peak was of a permanent, or at any rate semi-permanent, character, for I noticed it in three successive winters. Its persistence for such a long period is very curious, as during that time the dune must have advanced some 45 or 50 metres. The top of it too must have been repeatedly "turned" to some extent by southerly gales in every year, as shown in the photograph.

A sample of crusted sand from El Wad in the Algerian Sahara that I sent to the Natural History Museum was most kindly analyzed for me by Dr. G. T. Prior, who found that the cementing material consisted of carbonate of lime, and that the sand was free from the micro-organisms I had expected. Two other samples of caked sand collected at Ismailia in Egypt were also analyzed by the kindness of Mr. A. Lucas, the Superintendent of the Government Laboratory in Cairo. In this case the cementing material was found to be of a different character. The analysis was as follows:

	No. 1. %	No. 2. %
Total matter soluble in water	0·08	0·20
Chlorine	0·018	0·02
Equivalent as common salt	0·029	0·03

Both samples contained only a trace of carbonate. Sample No. 2, which was taken from the trough of a dune, contained "a little finely divided clayey matter;" but sample No. 1, which was taken from the top of the same dune, was free from this.

I once spent some hours during a sandstorm in experimenting on the shapes into which the wind would mould a bucketful of sand when poured out on to the top of a box. The results were very puzzling. After the wind had been allowed to play upon it for some time, the sand invariably assumed one of two forms. The first may be described as cigar-shaped—that is to say, a long narrow ridge lying up and down wind, with pointed or rounded ends and a curved cross-section. This form always maintained its character until the wind had blown it practically all away.

The second shape was approximately that of a D with the curved portion of the letter pointing up wind. The straight leeward side formed a distinct flat face, with the sand lying at the angle of rest, though the miniature dune was only about a couple of inches in height. With such a small pile of sand it was not possible to take accurate measurements of the curves; but they appeared to be of the same character as those of a full-sized crescent dune. The box on which the sand was heaped was of japanned iron, and if it had had a rougher surface for the grains to

cling to I have little doubt that the D shape would have developed horns and become a typical crescent. While wasting away under the action of the wind this form usually maintained its character so long as it can be said to have had any definite shape at all. But occasionally, before finally disappearing, it altered its ground-plan to that of a very diminutive "cigar-shaped" dune.

The curious fact about these experiments was that I found it quite impossible to foretell which shape the original heap of sand would take, nor could I discover what caused the pile at one time to develop into the cigar-shape and at another into the D form. The shape that these miniature dunes ultimately took did not seem to be in the least affected by the form of the original sand-heap. Sometimes the bucketful of sand was emptied in a cone-shaped pile in the centre of the box, at others into a ridge running up and down wind, and at others again into a similar ridge across the wind. But it appeared to make no systematic difference whatever to the result; sometimes one form would appear, and sometimes the other.

The amount of sand laid out cannot, I think, have had any effect upon the result. Though I did not actually measure it, the bucket was always practically filled, and the amount of sand left in the resulting dunelet could never have been much more than a tenth of the original amount. The sand used for the experiments was always of the same kind, being taken from the dune on which the box stood. As the box itself was placed on the summit of the dune, hardly any wind-borne sand could have reached the heap on the top of it, so the supply of sand during the shaping of the pile could have had no bearing upon the question.

The only solutions of the problem that I can offer are that the form that the miniature dune eventually took depended either upon the arrangement of the grains of sand on its surface relatively to each other at some critical period of its development, or upon changes in the velocity of the wind: extra strong gusts producing, say, the cigar shape and milder ones the crescent.

The narrowness of these belts of crescent dunes is very remarkable, but can, I think, be easily explained. I have seen the windward end of many of the smaller belts and have found that they invariably originate from a very narrow source. In one place, for instance, to the north-west of Kharga oasis, the continuous cliff of the limestone plateau that here forms the northern wall of the Kharga depression was broken by a gorge leading northwards. Beyond this opening lay a chain of small valleys, bounded by precipitous cliffs some 200 or 300 feet in height. The eastern and western walls of the southernmost of these depressions converged at a fairly acute angle on to this gorge and so formed a sort of funnel, running roughly in the direction of the prevailing wind. The sand carried down by this wind consequently came to a focus at this point, with the result that a sandhill had formed in the narrowest part of the opening and a

small line of crescent dunes stretched away for a mile or two to the south. The sandhill blocking the gorge was apparently stationary. The line of dunes to leeward of it were evidently offshoots from this parent dune, as one of them was still attached to it.

A dune which breaks off in this way from another dune or from a stationary ridge of sand can move only in the direction of the wind. The dunes which develop from its horns will also move in the same direction; so too will those that break off from a fixed dune behind them; consequently the whole series of dunes will follow the same path and form a long line running in the direction that represents the resultant action of the wind upon them. A belt of dunes formed in this way must be narrow, as it cannot well exceed in breadth the source from which it originated.

The rate of advance of the down-wind end of one of these belts is not by any means the same thing as the speed with which the individual dunes of which it is composed are travelling, for the leeward end of the belt is continually receiving additions in the form of new dunes thrown off by the old ones. These new dunes, being much smaller than those to windward of them, at first advance much more rapidly. But as they progress down wind they increase in size. Their advance is effected by the sand-grains blown over the top of the dune falling on the sheltered lee side and continually refacing it, so the rate of progress of a crescent dune under given circumstances is directly proportional to the height of its slipping cliff.

When viewed from some distance away to the east or west, the dunes of which these belts are composed often appear to be arranged at approximately equal distances apart and irresistibly suggest a succession of sea waves. This equidistant arrangement is not, I think, produced by any wave motion, as suggested by Dr. Cornish, but is due to entirely different causes.

When a wind that brings no sand with it blows over a dune, it reduces its bulk with every sand-grain that it blows off its lee end. But in normal circumstances this eroding action of the wind is more or less compensated by the sand that it brings with it on to the dune, a certain proportion of the grains brought in this way becoming caught in the troughs of the ripples and remaining behind to replace those that are lost.

The sand that comes on to a dune is not all brought to the bottom of the windward slope by the wind, but consists also of those grains carried by the wind at a higher level that are intercepted by the dune's upper part. During a wind the layers of air near the ground not only travel much slower than those above them, and consequently have less erosive force, but they are much more heavily loaded with sand. Consequently the lower a dune is the more sand it will intercept and the less it will be eroded by the wind in proportion to its height—and for both these reasons the faster it will grow.

At a certain distance above the ground the air is practically free from

sand. As a dune begins to exceed this height it exposes an increasingly larger surface to the erosive power of the wind without any corresponding gain in the increase of the amount of sand deposited upon it. So as a dune increases in height a balance is soon struck between the erosive action of the wind, tending to decrease its bulk, and the depositing action tending to increase it. The growth of the dune is consequently stopped.

Since all the dunes of the same district are presumably subject to about the same weather conditions, they will all be affected alike by the winds that prevail in the neighbourhood. So the full-grown dunes will not only tend to be of about the same size, but as they will all have increased in bulk at about the same rate, they will all have travelled approximately the same distance during the process of their growth. If they were thrown off a dune that was fully grown at the time, they will when fully developed themselves remain at a constant distance from it; and those dunes, like 19, that have formed from an intermediate dune that was not fully grown, will tend to catch up the full-grown dunes ahead of them and become incorporated with them to form a cluster. This I believe to be the explanation of the recurrence at regular intervals in these belts of large dunes and dune-clusters all travelling down wind at about the same speed.

Dr. Cornish made, I think, a very good point when he suggested in one of his papers that sand-dunes form themselves in some cases on lines of least resistance. This is not, of course, so in the case of dunes upon which winds from a variety of quarters have left their impress; but the windward portion of the whale-backed dunes, which are subject to such a strongly prevailing wind that after a gale from this direction the effect of all other winds upon their shape may be disregarded, must I think be a form of this description; for if one part of a dune departs from the true shape while the remainder of its surface conforms to it, obviously that part will offer greater resistance, with the result that the wind will act more strongly upon it and so wear it away more rapidly than the remainder of the dune. By perpetually removing these deformed portions the wind will gradually cut the whole dune to the true shape. I made a number of experiments on this point by digging pits and raising piles of sand on the top of a dune; but invariably the heaps were dispersed and the holes filled up and the dune returned to its original shape.

In the case of a whale-backed dune which is continuously rippled from the windward to the leeward end—showing that the wind closely follows the curve of the dune—I believe that its lee side is simply the space, sheltered by the upwind part of the dune from the direct action of the wind, which has become filled up with sand, the surface of which the current of air just grazes in its passage; for obviously any point on a long low curve like this, over which the sand is blowing, that is not reached by the wind, would tend rapidly to fill up, while any protrusion above its surface would be so eroded by the wind that it would rapidly disappear.

I agree, too, with Dr. Cornish in thinking that these shapes might

perhaps be worth studying by those interested in forms of least resistance, especially by builders of air craft, where the wind velocities to be dealt with would not be greatly in excess of those of the desert wind. When much higher velocities have to be considered, as in the case of projectiles, possibly new factors would be introduced which would make a comparison useless. The same difficulty too might apply to the use of these forms in water, though a race between a boat built on "wave lines" and one on "dune lines" might be instructive.

If it should be proved that these whale-backed dunes are forms of least resistance to the mean wind velocity, probably the shape that passes most easily through the atmosphere might be found experimentally, for a wind of any required speed, by causing a current of air of that velocity to blow for a sufficient length of time over a pile of dry sand to bring the heap to the true shape.

THE FUTURE OF INTERNATIONAL SCIENCE

IN the *Journal* for November last we remarked on the attempt of Prof. Bakhuyzen to keep alive the International Geodetic Association during the war, to the intent that on the conclusion of peace a General Conference should be held to decide upon the future of the Association. Our conclusion was that the attempt is doomed to failure, since so many scientific men of the Allied Powers are resolved that they will never again have dealings with men of the nation that has destroyed all possibility of sincere and cordial relations. In opposition to this feeling one sometimes hears it said that Science has no political boundaries, with the implication that we shall do wrong to refuse a renewal of the old international co-operation. To this argument there is an interesting reply in a note written to the *Journal des Débats* of 17 October 1917 by M. Emile Picard, the eminent Secrétaire perpetuel de l'Académie des Sciences. "The old International Associations, which were a springboard for Germanism, must therefore be regarded as dead." M. Picard's development of this theme will seem to our readers well worthy of preservation in a scientific journal of the times.

LES RELATIONS SCIENTIFIQUES INTERNATIONALES APRES LA GUERRE.

Les Allemands font en ce moment les plus grands efforts pour que, à la fin des hostilités, les relations scientifiques internationales reprennent dans les mêmes conditions qu'avant la guerre. Certains savants des pays neutres jouent le rôle d'honnêtes courtiers, s'efforçant de rendre la vie à des groupements internationaux morts depuis trois ans.

Il importe de déclarer bien haut que toutes relations personnelles

seront impossibles pendant bien des années entre les savants français et les savants allemands. Nous ne pourrons nous rencontrer à une même table avec des hommes dont quelques-uns auraient, si il était possible, déshonoré la science, en lui demandant les moyens de commettre des crimes jusque-là inconnus. Les atrocités sans nom, commises pendant cette guerre, ont mis pour longtemps l'Allemagne au ban des nations civilisées. Comme l'a dit si fortement le célèbre romancier anglais Kipling : "Nous savons maintenant qu'il y a sur la terre deux races, la race humaine et la race allemande."

C'est une idée fausse et dangereuse, que la science n'a rien à faire avec les questions nationales. Nombre de savants allemands ont été parmi les propagateurs du pangermanisme, et l'effroyable tourmente qui emporte le monde est en partie l'œuvre des professeurs des Universités germaniques. Depuis quarante ans, l'Allemagne s'est servie de la science, comme du commerce et de l'industrie ; elle en a fait un moyen de domination.

Les anciennes Associations internationales, qui étaient un tremplin pour le Germanisme, doivent donc être regardées comme mortes. Il n'y a qu'une manière de s'opposer à l'invasion d'adversaires déloyaux et fourbes, c'est de leur fermer la porte et de ne se prêter à aucune compromission avec eux. Nous arriverons, j'en ai plus que l'espérance, à organiser avec nos alliés et nos amis des groupements d'où l'Allemagne sera exclue.

Nous aurons de plus l'avantage de nous débarrasser ainsi des brumes de la pensée germanique et de l'esprit systématique allemand qui tourne si souvent le dos au sens commun. Nous n'ignorerons pas certes les travaux publiés en Allemagne, mais il n'est pas besoin pour cela d'avoir des relations personnelles avec les savants de ce pays. Nous profiterons, s'il y a lieu, de leurs découvertes, sans être leurs dupes, comme nous l'avons été trop longtemps.

L'exclusion des Allemands pourra entraîner au début quelque retard dans certaines œuvres collectives. Il sera regrettable assurément qu'un Corpus d'inscriptions paraisse plus lentement pendant quelques années, ou que des mesures sur la variation des latitudes soient un moment interrompues, mais ce sont là bien petites choses devant les intérêts généraux en présence. Les savants n'hésiteront pas, s'il est nécessaire, à faire quelques sacrifices en raison du but à atteindre, qui est d'isoler pour un temps l'Allemagne, afin de lui ôter la possibilité de reprendre ses rêves de domination universelle. Le sang de millions de morts l'exige, et nous serons récompensés au centuple, en retrouvant notre liberté dans tous les domaines et en faisant fructifier nos initiatives. D'ailleurs, une collaboration scientifique de plus en plus intime s'établira avec nos alliés, et nous retrouverons là ce que nous aurons pu perdre d'un autre côté.

Il a fallu, si je ne me trompe, une douzaine d'années après la guerre de 1870, pour que des relations scientifiques reprennent avec l'Allemagne. Par quel coefficient faudra-t-il multiplier ce nombre après le cataclysme actuel ? Il serait vain de le rechercher. On doit espérer qu'un temps

viendra où l'Allemagne, revenue de sa démence, pourra rentrer dans le concert des nations civilisées; mais l'histoire des peuples germaniques à travers les âges autorise toutes les méfiances.

THE "AURORA" RELIEF EXPEDITION, 1916–1917

Captain J. K. Davis

Published with the approval of the Governments of Australia and New Zealand.

THE *Aurora* sailed from Port Chalmers, New Zealand, for the Antarctic on 20 December 1916. The thorough overhaul and complete equipment of the ship before she left New Zealand contributed to the success of the voyage. She was provided with a wireless installation, and carried a crew of twenty-four, with provisions for eighteen months and over five hundred tons of coal.

Having embarked Sir Ernest Shackleton and received my final instructions from the New Zealand Minister of Marine, we put to sea early in the forenoon. Next day Antarctic clothing was issued to officers and men. A southerly course was followed, in moderate weather, until December 24, when high north-westerly seas made it necessary to bear away to the south-east, and this course was followed until the evening of December 27. Wind and sea then moderated, and it was possible to hold a more southerly course. The first ice was sighted on the same day—two tabular bergs each about ¼ mile long and 100 feet high, in 60° 50′ S., 179° 10′ W.

29 Dec. 1916. 64° 10′ S., 176° 40′ W.: Pieces of floe. Pack-ice has frequently been met by previous expeditions in this latitude. A considerable swell and the absence of pack on this occasion seemed to indicate that the Ross Sea was more or less open this season.

30 Dec. 1916. 66° 30′ S., 175° 40′ W.: Considerable loose ice. After a fair passage across the westerly wind belt we crossed the Antarctic Circle to-day. During this passage the constant high sea had caused the vessel to labour and strain to a considerable extent; but although deeply laden she made very little water, showing that the repairs in New Zealand had been carried out in an efficient manner. The food, stores, clothing, and equipment supplied to the *Aurora* have proved suitable and of excellent quality.

Wireless communication was maintained until December 26, when the aerial was blown down during a gale; the ship was then about 700 miles from the receiving station at Awarua, N.Z.

30 Dec. 1916. 67° 10′ S., 175° 00′ W.: At 8 p.m. we met a quantity of drift-ice and broken lines of pack with "blink" to the southward. As a passage round the pack-ice of the Ross Sea is quicker than a passage through it, we have been steaming to south-west true during the twenty-four hours, with the main pack to the eastward.

31 Dec. 1916. 68° 31′ to 70° 13′ S., 175° 30′ to 179° 31′ W.: Large pieces of pack, but fairly open.

1 Jan. 1917. The New Year found us steering through loose ice, skirting the pack in a westerly direction. At midnight on this day we reached the edge of the main pack, 70° 20′ S., 178° 46′ E. Very strong blink to south and south-west.

Jan. 2. We continued on a west and south-westerly course, the blink

becoming less marked, and conditions looking more promising as we proceeded. At 8 p.m. we entered the pack in 70° 20′ S., 175° 20′ E. Steering south-west through big leads until 4 a.m. of the 3rd, when pack became close.

Jan. 3. Some progress was made through leads to the southward, but as the ice became closer at 6 p.m. the engines were stopped, and we drifted with the pack. During the next three days we had a blizzard with thick snow. The *Aurora* drifted in the pack, or steamed through open leads.

Jan. 6. Mount Sabine was sighted, bearing south-west true, at 100 miles distance.

Jan. 7. The wind having moderated, we forced our way to the south-east through long lanes, afterwards getting into a long lead extending to south true. The recent gale had torn large channels in the pack, and by making use of these we entered the open Ross Sea at 4 p.m. in 72° 04′ S., 173° 09′ E. The passage through the pack had occupied five days, of which three were spent sheltering from the weather. The belt of pack where we crossed it was 104 miles wide. As we continued south through the Ross Sea fields of ice were visible along the western coast of Victoria Land as far as 76° 24′ S., 172° 10′ E., but were avoided by steering to the eastward.

Jan. 9. At noon Mount Erebus was sighted; and at 9 p.m. Beaufort Island.

Jan. 10. 5.55 a.m. Beaufort Island was passed at a distance of 6 miles, and we rounded Cape Bird into McMurdo Sound. No pack-ice was met, but off Cape Barne the fast sea-ice extended right across the sound. Cape Evans was visible 7 miles to the southward, but no signs of life could be seen. When we came alongside the ice-edge at Cape Royds a party under Sir Ernest Shackleton went to the hut of the 1907 Expedition to look for some record. A letter was found stating that the Ross Sea party was housed at Cape Evans. Just before the return on board of Sir Ernest Shackleton a party of six men, with dogs and a sledge, was sighted approaching the vessel from the direction of Cape Evans. At 1 p.m. this party reached the ship, and we learned that of the ten members of the expedition left on shore when the *Aurora* broke away on 6 May 1915 seven had survived, viz. A. Stevens, E. Joyce, E. H. Wild, J. L. Cope, W. Richards, A. K. Jack, and I. O. Gaze. These seven men were all well, though they showed traces of the ordeal through which they had passed. We learned with deep regret that the Rev. A. P. Spencer-Smith had died of scurvy on the Barrier 20 miles S. 60° E. from Hut Point on 9 March 1916, and that Captain Macintosh and V. G. Hayward had perished in a blizzard while attempting to cross the sea-ice from Hut Point to Cape Evans on 8 May 1916.

Jan. 11. After completing some repairs to the main engines we got under way at 10.30 p.m. and proceeded towards Butter Point, where the only food depôt known to the missing men was situated. The weather was fine and clear, and I considered that, as a remote possibility existed of Macintosh and Hayward having drifted across to the western shore, the vicinity of Butter Point should be examined. The ship reached a point 5½ miles east of Butter Point before being stopped by the fast ice. A party under Sir Ernest Shackleton now left the ship to search the locality; but "the land-ice had broken away and was visible in the form of two large bergs grounded to the north of Mount Barne. There was no sign of the depôt or of any one having visited the vicinity." After this report from Sir Ernest Shackleton we returned to the fast ice off Cape Barne, whence Cape Evans bore east by south true, distant 5 miles.

Jan. 13. Sir Ernest Shackleton and party left the ship with the object of searching the area north of Glacier Tongue, including Razorback Island, for traces of the two missing men. The *Aurora* proceeded to Cape Royds, where some fresh water was obtained from a berg. A record was left at the 1907 hut in this form :—

"S.S. *Aurora*, McMurdo Sound, 11 January 1917.

"The Government Relief Expedition under my command arrived here all well on January 10, and relieved the seven surviving members of the Shackleton Expedition : A. Stephens, E. Joyce, J. L. Cope, E. H. Wild, R. W. Richards, I. O. Gaze, and A. K. Jack.

"The *Aurora* will leave McMurdo Sound during the next week for Wellington, proceeding northwards past, and in sight of, Cape Adare—if ice conditions permit.

"Signed,
"JOHN KING DAVIS."

Jan. 16. Alongside fast ice at Cape Evans. Sir Ernest Shackleton and party returned to the ship ; after three days' search the leader reported as follows :—

"I consider that all places likely to hold the bodies of Macintosh and Hayward have now been searched, and there is no doubt in my mind that they met their deaths on the breaking up of the thin ice when the blizzard arose on 8 May 1916. Messrs. Jack and Wild were busily employed in squaring up the hut and in erecting the cross to the memory of the three men who lost their lives in the service of the expedition."

Jan. 17. At noon, the ice having set out of the sound to the northward, we proceeded in that direction to examine the ice conditions. Heavy pack obliged us to turn back south at 4 a.m. on 18 January.

Jan. 18. As nothing further could be done by remaining here I decided to get out of the surrounding pack and proceed to Wellington. From Ross Island —open sea southwards to Cape Barne. Dense pack northwards from Cape Bird past Beaufort Island closing in to the land near Nordenskiold Ice Tongue.

Jan. 20. 75° 02′ S., 171° 22′ E. : Loose lines of pack.

Jan. 21. 73° 08′ S., 172° 42′ E. : Line of pack to west, extending N. and S.

Jan. 22. 71° 38′ S., 173° 44′ E. : Dense pack ahead, with marked blink to northward. Proceeded south again. We have had a fresh northerly wind for some days. At noon to-day we were about 60 miles from Cape Adare. A marked blink over the northern horizon indicated that the winds from that quarter had closed the pack. Not thinking it advisable to try and force a passage round Cape Adare, we returned southward through open water.

Jan. 25. Off Beaufort Island and standing towards Cape Royds, but 5 miles north of Cape, we reached the edge of pack, which now filled the whole southern end of the Sound. We steamed slowly back to the northward again, and continued in that direction until Jan. 29, where we were able to approach Cape Adare, closely passing between the pack and the land into open water.

Jan. 28. 71° 00′ S., 171° 40′ E. : Scattered line of pack seen.

Jan. 29. 70° 50′ S., 171° 30′ E. : Off Cape Adare, close pack east to west through north. Made way through it, good water sky to northward.

Jan. 30. 68° 40′ S., 170° 56′ E. : Dense pack to west, with lines across ship's course. Pack became thicker and continued to 67° 08′ S.

Jan. 30. 66° 10′ S. : Scattered ice.

Jan. 31. Crossed the Antarctic Circle. Sighted numerous bergs during next few days, the last one being in 63° 31′ S., 171° 50′ E.

Feb. 4. Wireless message sent to Navy Office, Melbourne.

Feb. 6—8 : South-west gale for forty-eight hours. *Aurora* averaged 9 knots under steam and sail.

Feb. 9. *Aurora* arrived in Wellington all well at 7 p.m. this evening.

GLACIERS AND PASSES OF THE KARAKORAM

Two Summers in the Ice Wilds of Eastern Karakoram.— Fanny Bullock Workman and **William Hunter Workman.** 8vo. *Maps and Illustrations.* Pp. 296. London : T. Fisher Unwin. 1917. 25*s. net.*

IN June 1909 Dr. T. G. Longstaff, Dr. Arthur Neve, and Lieut. Morris Slingsby set out from Goma at the head of the Saltoro valley in Baltistan to search for the reputed pass across the frontier of Kashmir and Turkestan, somewhere between the now well-known Karakoram Pass that Thomson was the first European to reach in 1848, and the Muztagh Passes that Sir Francis Younghusband forced in 1888. Here only eight years ago there was a whole square degree of country that had never been entered, full of high peaks and glaciers, presumably quite uninhabited, and of which the natives of the surrounding valleys had very little even of legend to tell. Ten years before Sir Francis Younghusband had made a spirited attempt to get through from the north, up the Urdok glacier at the head of the Oprang River, and had come within sight of a col which, though perhaps passable by strong mountaineers, could not be reckoned a practicable route such as he sought. This col he called the Saltoro Pass, because, as he has explained, he thought it led into the Saltoro Basin, and he did not know what else to call it. When Dr. Longstaff and his party started from Goma up the Ghyari nala they expected to reach this pass. The Rajah Shere Ali Khan of Khapalu had told them that beyond the pass at the head of the Bilafond glacier there were two routes, to Nubra and to Yarkand, which had been abandoned not so long before, when the easier passage by the Karakoram Pass became safe under the British raj. So when they had crossed their "Saltoro Pass" and saw before them a great glacier running south-east and north-west, they took it for the Urdok glacier, until on closer acquaintance it proved to be flowing from and not to the north-west. The point where they struck it was so admirably adapted to a rapid reconnaissance that by strenuous work with plane-tabling from a roughly measured base Dr. Longstaff was able to produce the map of the upper Siachen glacier that was published in the *Journal* for June 1910. But when small supplies compelled a retreat by the way they had come, they had not recognized it for the Siachen at all, believing that they were across the watershed, and that their glacier must somehow turn north into the basin of the Yarkand River. It was not until three months later, on the ascent of the Siachen glacier from its tongue in the Nubra valley, that Dr. Longstaff found himself approaching the point he had been at before, and proved that the Siachen is the longest glacier in Asia. This result, curiously enough, he had reached through a desire to avoid the Siachen altogether in the early part of that season, because Dr. Neve and Captain Oliver had proposed to ascend it from its tongue in the autumn of that year, and he wanted to avoid trespassing.

From the point which he had reached in June, a saddle was seen at the head of the glacier to the north-west; and when it became clear that his

Saltoro Pass was not the same as Sir Francis Younghusband's, it was natural to suppose that the latter was represented by the saddle. Consequently, upon his map the pass at the head of the Bilafond glacier is called the Saltoro Pass, and the saddle is called Younghusband's saddle.

This long preamble is necessary to make clear some points that we shall have to consider in the book under review. It is an account of explorations in the Eastern Karakoram in 1911 and 1912, the authors' seventh and eighth seasons in the Himalaya. Leaving Srinagar in May 1911 they marched by Sonamarg over the Zoji La, the "pons asinorum to many tourists in Kashmir," and proceeded *viâ* Kapalu to the Sher-pi-gang and Dong-dong glaciers of the Kondus valley, lying in its eastern or Korkondus branch, while their surveyor, Dr. Calciati, explored the Kaberi glacier for some 10 miles. Returning by Karmading to Hulde they ascended the Hushe valley with its remarkable fans and stratified beds of clay, and pushed up the Masherbrum nala, whence they climbed over the Masherbrum glacier to a peak of nearly 17,000 feet. From this peak, which they have named Quartzite Peak, they were able to convince themselves that the pass reported by the late Mr. Sillem from the Hushe valley to the Baltoro cannot exist. But they were unable to see, as they had hoped to do, the upper reaches of the Crescent glacier, which they had found in a previous season flowing south of Mango Gusor and turning north along its western flank. From a camp on the side of Quartzite Peak Dr. Workman made the curious observation of a very black shoulder, whose débris formed a large moraine and covered the ice to leeward with a black dust that strongly suggested coal.

Returning from the Masherbrum glacier, they proceeded to explore the other glacier feeders of the Hushe River—the Khondokor, the Chogolisa, and the Aling—finding them alike in the inaccessibility of their surrounding cliffs, in the absence of any pass at the head, and in the full vigour of their flow, with no sign of retreat at the tongue, and generally no open passage left along the sides. Dr. Workman, who is responsible for the first part of the book, gives a careful account of what he was able to gather of the structure of the surrounding peaks, and remarks on the curious growth of cedars high up in niches on the rock faces while none are found on the nala floor at the same height. The more serious results of his glacier studies are published in the *Zeitschrift für Gletscherkunde*, 8, 1914; but there is much of general interest in his account of these great glacier systems of what he calls the Karakoram type; and his photographs are magnificent.

Towards the end of the season of 1911 the expedition turned east, following Dr. Longstaff's route over the Bilafond glacier and his Saltoro Pass above it (which they call the Bilaphond La), to the Siachen glacier, which Mrs. Workman often prefers to call the Rose glacier, since Siachen means rose-bush. Resolved to make a thorough examination of this region, they devoted to it the whole season of 1912, engaging the services of Captain Grant Peterkin as surveyor; and they have produced a study of the glacier which is in many ways remarkable. It was published pretty fully in the two papers which the explorers read to the Society in November 1913 (*Geog. Jour.*, 43, 117, with map and 273), so it is enough to mention here some points of topography on which they lay much emphasis—the involved questions of the Saltoro Pass and Younghusband's saddle.

First there is the question whether the pass by which one reaches the Siachen from the Saltoro valley shall be called the Saltoro Pass, or the Bilafond La, or the Bilaphond La. The Survey of India have decided against

the first, and prefer the third. The only remaining question is of spelling. Dr. Longstaff writes the name of the glacier Bilafond. When the Survey adopt the form Bilaphond, following Mrs. Workman, do they intend that it shall be pronounced Bilap-hond, or are they breaking the rules and writing *ph* for *f*? Apart from this doubt, the decision of the Survey is clearly sound, for the name Saltoro was given by Sir Francis Younghusband to a pass which

Urdok Glacier
Saltoro Pass (Younghusband)
Younghusband's Saddle (Longstaff)
Turkestan La (Workman)
S I A C H E N G L A C I E R
Saltoro Pass (Longstaff)
Bilaphond La (Workman)
Bilaphond Glacier
Scale of Miles
5 0 5 10

The above outline of the glaciers is taken from the sketch-map on the scale of 4 inches to 1 inch, prepared by the Survey of India to illustrate Dr. Longstaff's journey. It will serve as a diagram to explain the points discussed in this review. Mrs. Workman's Indira col is something more than a mile north of "Younghusband's Saddle." The position of her "Turkestan La" is shown approximately in its relation to the saddle; it is not so close to the main Siachen glacier as the diagram shows. Detailed maps of the region were given in the *Journal* following the papers by Dr. Longstaff and Mrs. Bullock Workman (*G.J.* 35, 622 and 43, 232).

certainly does not lead to the Saltoro basin; while Dr. Longstaff adopted it for a pass which does lead from the Saltoro basin, but is certainly not the pass which Sir Francis named.

The next question concerns the gap which Dr. Longstaff saw far away at the head of the Siachen glacier, and named Younghusband's Saddle. Mrs

Workman describes it as a "snow-gap with a bergschrund at its base. . . . The supposed saddle is a narrow connecting link between two elevations of the intricate Siachen reservoir, merely an idiosyncrasy of Nature thrown in to mislead any one casually looking up from the middle Rose." Beyond this false saddle lies a deep snow-basin, the natural watershed being further back. "Some distance to the north"—a distance more than a mile, but not otherwise defined—they came to a cornice above a perpendicular snow-wall falling 5000 or 6000 feet to a basin, and below it the head of a glacier flowing north-north-east, which seemed to be the Gasherbrum glacier. This identification is based on her own observations, and "after consultation with Colonel Sir Francis Younghusband," though the evidence seems to us far from conclusive. The cornice they have named the Indira col, and the name Younghusband's Saddle is omitted from their map.

Some 4 miles south-east along the watershed from the Indira col they found a snow col at a height of 19,210 feet—which they named the Turkestan-La—with a drop of 2000 feet on to a short crevassed glacier, which as an affluent joins a wide trunk glacier flowing north-west. After consultation with Sir Francis Younghusband "there appears to be but one conclusion possible, that this is the glacier he ascended in 1899 when in search of the Saltoro pass, and named the Urdok. . . . If this be the case, it is the col at the head of the Urdok glacier which should bear the name of Younghusband's Saddle, and not the meaningless false col lying some miles west. . . ." There seems to be no evidence that there is a col at the head of this glacier which could have looked promising enough to Sir Francis Younghusband to warrant his taking it for the pass he sought; and even if Sir Francis was willing to accept Mrs. Workman's identification as a probable solution, we believe that his route traverse, with an astronomical latitude, but doubtful in longitude, is not really sufficient to decide the question, whether when he turned back from the impracticable head of the Urdok glacier he was below the Indira col or some miles further west. The Survey of India, in the sketch-map which they made to show Dr. Longstaff's route, took the former view; and we know of no substantial reason to alter it. The argument derives its importance from the point which we have now to make.

Throughout the book which Dr. and Mrs. Workman have written there is a constant disparagement of Dr. Longstaff, which adds a disagreeable flavour to what should have been a wholly fascinating tale. First we have two pages of comment on the case of the "two sahibs carrying their own luggage" [Longstaff and Slingsby: see *Geog. Jour.*, 35, 624]—one of them a "traveller on his first visit to Baltistan" [Longstaff]—of whom it was told in coolie gossip repeated by Dr. Workman, "that they were not *bara* (or important) sahibs with a numerous following." The disparaged travellers "descended into the Siachen basin, remaining one day;" theirs was a "short visit," a "short stay," a "cursory visit," a "limited visit;" and not further to abuse the richness of the English language, again "only one day," and a "short visit." Dr. Longstaff only "decided that the glacier extended further north than had been supposed," while the map of the Workman expedition is the "first detailed and fairly accurate map," though it is in its main features entirely corroborative of Dr. Longstaff's.

The first impression given by this book will be that it is an uncalled-for and ungenerous attack on Dr. Longstaff, and this, we feel assured, will be the final verdict of geographers; but Dr. Longstaff, however, does not suffer alone. The authors twice speak slightingly of Colonel Godwin Austen. Because Dr. Neve is well known for surgical skill and care for sufferers in

lonely places, Dr. Workman must "mention the presentation of deformed and incurably diseased persons to the notice of the traveller as an unnecessary annoyance. . . . Incidents of this kind described in Holy Writ as occurring in Palestine two thousand years ago are almost exactly reproduced here to-day, so many thousand miles away." The parallel is startling but not complete, and it were better avoided. Our travellers have no love for the people of the country. The headman, who had served Dr. Longstaff well, this "native paragon" is charged with theft and swindling, though he "was certainly the best of the Kapalu Court retainers with whom we had to do, the others being most egregious rascals." A "Srinagar babu . . . proved to be the second human black sheep in our caravan;" and in fact "perhaps some in our employ become possessed of the evil eye, for on different occasions men we have employed, praised for character by other persons, have proved harmful and even dangerous to the furtherance of our interests." Only one found favour in his master's sight, a Pathan entrusted with the duty of clearing the road. "This task suited his talents exactly, which could not be said of some of his other duties, and he performed it admirably, not only by vigorous use of voice and stick forcing the pony-wallahs and shepherds to drive their animals forthwith from the path, sometimes on to declivities of dangerous gradient and character, but also with an air of great authority compelling native travellers mounted or on foot, of any rank lower than a Raja or Tehsildar to step aside till we had passed. His zeal in the performance of this office proved a great convenience and also a source of considerable amusement to us." A passage such as this will be read with profound regret by all Himalayan travellers and Anglo-Indians. The authors would seem to have forgotten that they were guests in a foreign land, and responsible for their servants' behaviour as much as for their own.

To another aspect of this expedition we feel impelled to accord the prominence desired by the, shall we call it, self-consciousness of the "lauriate (*sic*) used in the Continental sense," who appears in a pair of striking pictures facing p. 128. A note concluding the account of the work on the Siachen proclaims that "a woman was the initiator and special leader of this expedition . . ., and at present it behoves women, for the benefit of their sex, to put what they do, at least, on record. In stating this I do not wish to ignore or underrate the valuable co-operation on this expedition of my husband."

Personalities apart, the book is written with skill, and the topographical descriptions of intricate country are generally full and easy to follow with the maps. Some ugly words are introduced, as séracked, schrund-gashed, monsoonish, snow-*tourmentes*, and pocket-penitente; while the phrase "a great blow-out reigned all night at this camp" is open to misunderstanding. But the strong element of antagonism to those who had preceded them must be held to deprive the authors' work of judicial value in the determination of disputed points. It is a thousand pities that this should be so. Dr. and Mrs. Workman have many of the aptitudes required for scientific exploration of the highest class—courage and skill, strength and endurance, geographical insight and facility in description.

If they fail to reap their natural reward in the cordial appreciation of their readers it will be because of the lamentable temper they show in regard both to the explorers who went before them and to the people of the country in which they were allowed to travel.

SIR CLEMENTS MARKHAM

The Life of Sir Clements R. Markham, K.C.B., F.R.S.— Admiral Sir Albert H. Markham, K.C.B. London : John Murray. 1917. 15*s*.

SIR ALBERT MARKHAM states in his preface that his object in writing his cousin's 'Life' has been not so much to draw attention to his merit as a man of letters and great geographer, as to bring out the distinctive characteristics of his personality as a boy and as a man. A close friendship of over sixty years gives Sir Albert special qualifications for such a task. Moreover he has had at his disposal the many volumes of diaries and note-books which Sir Clements kept from his boyhood, and which afford an insight into his unique character. Indeed the wealth of material must have been embarrassing, rendering selection difficult. On the whole the author has carried out his congenial task with judgment in giving us the chronicle of Markham's life from year to year and often from day to day. Sir Albert devotes about one-third of the volume to the years of Markham's childhood and youth —to his residence for his first eight years at Stillingfleet in Yorkshire, where his father was vicar, then at Great Horkesley in Essex, where his father became rector, with occasional sojourns at Windsor when his father was in residence as Canon. At the age of nine he went to school at Cheam, where he remained till he entered his dearly-loved Westminster at the age of twelve. From Westminster at fourteen he entered the Navy as cadet on the *Collingwood* under Admiral Sir George Seymour, cruising for four years on the Pacific station. After a few months in the Mediterranean he joined in 1850, at the age of twenty, the Franklin Search Expedition under Captain Horatio Austin.

In devoting so much space to Markham's first twenty years, Sir Albert enables the reader to watch the development of those features which were so strongly marked in his character in after years—his keenness of observation, his phenomenal memory, his passion for work, his persistence in whatever he undertook, his capacity for friendship, his liability to personal prejudice, his readiness to succour distress and to champion the oppressed. He was able to describe in detail persons and places he saw when he was only two years of age ; he seemed never to forget anything he ever heard or saw. His *Cacoethes scribendi* manifested itself when he was a mere boy. When he was at school at Cheam he wrote a description of every boy (there were about fifty), including himself, as also of all the masters, ushers, and other officials connected with the school. This practice he carried with him throughout life. When he entered the Navy he would deal in the same way with the officers of the ship, giving their genealogy, and drawings in colour of their coats-of-arms ; so also on the Arctic expeditions in which he took part. When only ten years of age he wrote a 'History of England' in eight chapters, with maps of England and Wales drawn and coloured by himself ; of this his father printed twenty copies in his private press. This was followed by the Lives of about thirty historical characters, and of a work entitled 'Astronomy and Physical Geography.' He was then about sixteen years of age. This addiction to writing rapidly increased as he grew older, and in the appendix is a list of close on a hundred publications, including the volumes contributed to the Hakluyt Society, of which he was the author, besides others which he left in a more or less complete state. All this in addition to the many papers he contributed to the publications of the Geographical and other societies. Work, indeed, was the all-absorbing element of his life ; his only recreation was a fresh piece of work.

The portraits of Markham included in the volume justify the remark of an officer that he was the most beautiful and most engaging boy on board. During the four years' cruise of the *Collingwood* in the Pacific, Markham, besides keeping a detailed Journal, wrote, among other things, a History of the Pacific Station. He entered heartily into the work of the ship, but at the same time was ever ready to join in the high jinks of the other youngsters on board. He became an unusual favourite, even with the sailors, in all of whom he took a personal interest. It was while on the *Collingwood* he had his first chance of visiting South America. He became intensely interested, especially in the old civilization of Peru, and this interest was to bear abundant fruit in after years. But his experiences on board the *Collingwood* were not altogether of a pleasant character. He got into serious trouble through the Naval Instructor, who, he believed, treated him with great injustice. Although his bitter feeling cooled down somewhat in time, he never really forgave the Instructor. This indicates a feature in Markham's character which remained and developed in later life —a contrast to his wonderful capacity for making friends, and his readiness to incur any amount of trouble and expense for those, of any rank, in whom he was interested. This incident, combined with the horror of a sensitive nature and a really tender heart at the barbarous methods then in vogue of enforcing naval discipline, gave him a distaste for naval service which he was never able to overcome.

Markham's experiences in the Franklin Search Expedition infected him with that devotion to Polar, especially Arctic, exploration which remained with him to the end, and which in time led to the equipment of the *Alert* and *Discovery* in 1875–6, and Scott's first Antarctic expedition. This led to Markham's first important publication, 'Franklin's Footsteps.' On his return in 1852 he finally decided to quit the Navy, but he remained to the end of his life at heart a sailor. He took an intense interest in all that concerned the Navy, and nothing delighted him more than to be in the company of young naval officers, or to be a guest on board a cadet training squadron. His delight in youth was one of his strongest characteristics. He was constantly having boys from the *Worcester* or from Westminster at his house. He would give them luncheon, take them to see the sights of London, give them dinner at a restaurant, and frequently end by a night at the theatre ; and all this while he might have a dozen books or papers in hand and many official duties to attend to.

Although his father regretted that his son should quit the Navy, still he was so sympathetic as to give Markham £500 to carry out his long-cherished visit to Peru. And now began his real life-work. Sir Albert Markham gives in some detail the story of his cousin's first expedition to Peru, as also of the second, a few years later, for the purpose of collecting cinchona plants for transference to India ; on the latter expedition he was accompanied by his wife, whom he married in 1857, and who was his devoted helpmate to the end of his life. The cinchona expedition led to several visits to India and Ceylon in order to see that the plants were suitably dealt with. But he did not content himself with this. With his usual versatility he interested himself in various Indian problems, such as schemes for irrigation and the improvement of oyster culture at Tuticorin. It was after his first expedition to Peru that he became a Fellow of the Society, 1854. Nine years later he was elected Honorary Secretary, an office which he held for twenty-five years. After a few months' drudgery in an office in Somerset House he obtained, in 1854, a post in the India Office, to which he remained attached for several

years. Then came the Abyssinian War Expedition, 1867, to which he was appointed Geographer.

Markham was now up to his neck in work to the end of his life. He was first Secretary and then President both of the Geographical and the Hakluyt Societies, and in both he was more or less the moving spirit. Of all his work in this connection and the many other tasks which he undertook, Sir Albert gives a very satisfactory idea. He was never without one or more books on hand, not necessarily geographical; busy organizing expeditions, trying to succour some one in misfortune, promoting education in the Navy, organizing and presiding at international congresses, entertaining explorers of all nationalities, travelling abroad in search either of information or health, or cruising with a training squadron. Whatever he was doing, even if on a visit of only a few days, he invariably took his work with him and turned to it for recreation whenever he had leisure. Once in later years, when on holiday on the Continent, he compiled as a diversion complete genealogies of the reigning sovereigns of Europe.

So far as his twelve years' presidency of the Society is concerned Sir Albert Markham gives a fairly adequate idea of his various work—in addition to Scott's first Antarctic expedition—in the encouragement of exploration, of research, of the movement for the improvement of geography and geographical education, of the internal organization of the Society, and in other directions. In short, he has rendered a service to this remarkable man by bringing together in one volume a straightforward and unambitious record which will enable the reader to form an idea of what manner of man Markham was, and what were the many services he rendered to his generation. To those who had only a casual acquaintance with Markham, his nonchalant manner and his apparent lack of observation, this narrative may come as a revelation. Naturally the narrative is marked by a friendly tone throughout; but those who can read between the lines may see that a man of his driving character and definite convictions in any matter he had to deal with must have had occasional collisions that gave rise to resentments. But that is a point on which we need not dwell, nor is it necessary to repeat what has already been said in the *Journal* at the time of his death. This is not the place, even if the writer were competent, to enter into criticism of Markham's methods and their voluminous results. We need only thank Sir Albert Markham for presenting us with such a portrait of one of the outstanding personalities of his time, and for half a century the accepted representative all the world over of geography in England.

J. S. K.

THE PRESENT TIME-TABLE ON THE CAPE TO CAIRO ROUTE

WE are indebted to a correspondent for the following time-table, which he has compiled with the assistance of the Sudan Government Railways, the Uganda Railway, and the British South Africa Company. The time from London to Port Said is the pre-War timing; the times on the various stages of the African journey are minimum times which could be made in case of necessity with Government priority. For ordinary passenger traffic it would be necessary to add at least 10 per cent. on certain sections of the journey. The table is of interest as showing present conditions, when the future of the Cape to Cairo scheme is naturally under discussion. The journey now involves only

two comparatively short stretches on foot or in hammock: from Redjaf to Nimule, 150 miles, and from Mwanza to Tabora, 200 miles. For this 350 miles at least fifteen days is allowed in the time-table; as soon as these two pieces of road can be made passable for motors the time will be reduced by about twelve days, and it will be possible to go the whole way from Port Said to Capetown by modern methods of conveyance.

A. London to Cairo, 4½ days.				
a. London to Brindisi ...	Rail	1410 miles		48 hrs.
b. Brindisi to Port Said ...	Sea	925 ,,		48 ,,
c. Port Said to Cairo ...	Rail	148 ,,		4½ ,,
B. Cairo to Khartoum, 3 days.				
d. Cairo to Shellal	Rail	555 ,,		23 ,,
e. Shellal to Halfa	River steamer	208 ,,		42 ,,
f. Halfa to Khartoum ...	Rail	579 ,,		24 ,,
C. Khartoum to Butiaba (Lake Albert), 21–24 days.				
g. Khartoum to Redjaf ...	River steamer	1096 ,,		14 days
h. Redjaf to Nimule ...	Track	150 ,,		5–8 ,,
i. Nimule (Dufile) to Butiaba (Lake Albert)	River steamer	165 ,,		2 ,,
D. Butiaba to Mwanza (Victoria Nyanza), 5½–12 days.				
j. Butiaba to Masinde Port	Motor road	79 ,,		8–10 hrs.
k. Masinde Port to Namasagali	Small steamer	101 ,,		2 days
l. Namasagali to Jinja ...	Rail	64 ,,		1 day
m. Jinja to Mwanza	Steamer	180 ,,		2 days
or				
n. Butiaba to Entebbe ...	Track	180 ,,		10 ,,
o. Entebbe to Mwanza (across Lake Victoria)	Steamer	170 ,,		2 ,,
E. Mwanza to Albertville (Lake Tanganyika), 12–14 days.				
p. Mwanza to Tabora ...	Road	200 ,,		10 ,,
q. Tabora to Kigoma on Lake Tanganyika ...	Rail	260 ,,		1–3 ,,
r. Kigoma across L. Tanganyika to Albertville ...	Lake steamer	60 ,,		1 day
F. Albertville to Bukama (Congo), 8 days.				
s. Albertville to Kabalo ...	Rail	166 ,,		1 ,,
t. Kabalo to Bukama ...	River steamer	400 ,,		7 days
G. Bukama to Cape Town, 8 days.				
u. Bukama to Tshilongo ...	Rail	126 ,,		1 day
v. Tshilongo to Elizabethville	Rail	166 ,,		1 ,,
w. Elizabethville to Bulawayo	Rail	946 ,,		3 days
x Bulawayo to Cape Town	Rail	1362 ,,		3 ,,

Alternative route, Sections C, D, E, F.

Redjaf to Bukama, 25 to 28½ days.

1. Redjaf to Libogo (Congo frontier)	Motor	1 day
2. Libogo to Bambili viâ Njangara	Track	12 days (about)

3. Bambili to Buta	Motor	1 day
4. Buta to Bumba (Congo)	River steamer	1 „
5. Bumba to Stanleyville	River steamer	3 days
6. Stanleyville to Ponthierville ...	Rail	½ day
7. Ponthierville to Kindu	River steamer	3 days
8. Kindu to Kongolo	Rail	1 day
9. Kongolo to Bukama	River steamer	4 to 7 days
Connections with East Coast.		
Atbara to Port Sudan	Rail	1 day
Entebbe to Mombasa	Lake steamer and rail	2½ days
Tabora to Dar-es-Salaam	Rail	2 „
Bulawayo to Beira	Rail	2 „
Connections with West Coast.		
Bumba to Boma	River steamer and rail	12 „

REVIEWS

EUROPE

Through Lapland with Skis and Reindeer.— F. Hedges Butler. London: T. Fisher Unwin. 1917. Pp. 268. *Maps and photographs.* 12*s.* 6*d. net.*

THE author's travels, which extended over several hundred miles, were made over beaten tracks passing numerous villages and rest-houses, so that a good night's lodging was generally obtained. His main journey was from Bossekop to Vadsö by way of Karasjok and Enare. He visited the monastery of Pechenga founded by St. Tryphon in the sixteenth century, and gives a history of its origin and remarkable vicissitudes. His account of the country is rather meagre, but he says much that is interesting about the modern Laplander and his mode of life. Physically, mentally, and morally he does not compare unfavourably with more fortunate peoples. The Lapps are good-tempered, hospitable, and peaceful. They have large families, and are very fond of their children. The method of land distribution surviving from ancient times, the village communal meetings, and the archaic custom of placing upon his grave the belongings of the dead, as his axe, fishing gear, or even his sleigh, are described. A chapter entitled "In the Far North" is devoted to a journey from Kiruna, near the Swedish frontier, to Kolvik, passing through Karesuando, Kautokeino and Karasjok. This is disappointing, and it is at times rather difficult to follow the author, in spite of the large map at the end of the book. The climate of the Murman coast is discussed at some length, and the author's opinion is evidently favourable, for he thinks that this region may become a tourist resort. The ski-ing, he says, is good, and there will be good opportunity for the sport after the Swiss season is over. The book is written very much from the tourist point of view, and suggests now and then the guide-book, giving the routes from England and, in appendices, lists of rest-houses, telephone and telegraph stations, with a description of the roads, waterways and routes. The author took with him a well-known photographer, Mr. Borg Mesch, of Kiruna, and the book is illustrated with more than fifty excellent photographs. The author's own travels are preceded by an account of the

"Laplanders of Old," taken very largely from Sheffer's 'Lapponia,' a translation of which was published at Oxford in 1674. The book has no index, but a bibliography is added from which there is one notable omission. It is the 'Tour in Lapland' of Linnæus, made in 1732. A translation of this interesting account of Lapland and its inhabitants by the celebrated Swedish botanist, illustrated with rough line drawings by himself, was published in London in 1811. It is remarkable, considering his great fame, how little it is known.

E. A. P.

Il Trentino.— Cesare Battisti. Novara: De Agostini. 1917. *Maps.* 3*s.* 6*d.*

This little book with its nineteen useful maps is an admirable summary of the geography of the Trentino in the widest sense of the term. Seeing that it is concerned with what is, after all, merely a portion of Tirol in Austrian eyes, much of the information can have been procured only with considerable difficulty. A few lines on the geology of the region would have removed the one important omission we have noted. The Alto Adige is dealt with quite briefly, since only the southern districts can be claimed as Italian, though there is good reason for believing that the Italian element is much larger than it appears in the Austrian census. Cesare Battisti has given his life for his cause. He was taken prisoner while serving with the Italian Alpini, and shot as a traitor by the Austrians. We are glad to learn that his memory is to be honoured by the founding of a scholarship for geography in Italy.

L. C.-M.

AFRICA

German East Africa.— Albert F. Calvert. London: T. Werner Laurie. 1917. Pp. xx. and 122. *Maps and Illustrations.* 5*s.*

This little book is mainly an account of the economic resources of, and the development of trade in, German East Africa. There are also brief historical notes and some account of physical features. Industriously compiled, though not very well arranged, it contains information, gathered largely from official sources, useful for those who may intend to settle in or trade with the country. There are several small sketch-maps and over two hundred illustrations (reproductions of photographs) which give an excellent idea of the character of the land and the chief towns. The historical section of the book, besides being scrappy, is remarkable for its references to Carl Peters, who is said to have been "rewarded for the conception and creation of German East Africa by an official persecution of intrigues, libels, and national ingratitude which was almost incredible in its malevolence." Considering recent events, it is, perhaps, surprising that Peters' doings should have been condemned in Germany, but condonation of his conduct by an Englishman who has made any study of German colonial records is unexpected. Mr. Calvert's further statement that Peters is dead is not correct. Peters is still using his pen to attack the country which gave him harbourage when it was imprudent for him to live in his native land.

F. R. C.

Marching on Tanga. (With General Smuts in East Africa.)— Francis Brett Young. Pp. xii. and 265. *Map and Illustrations.* London: W. Collins, Sons & Co. 1917. 6*s. net.*

Captain Brett Young, a medical officer attached to the East Africa Expeditionary Force, accompanied military units on their march from Taveta to the Pangani, took part in the weary trek by the right bank of that river, and then went, by Handeni, to the outskirts of the Nguru Hills. (Though "marching on Tanga," he never reached his objective.) The region covered forms a very

small part of East Africa, and there were no "discoveries" to make. Yet it is most probable that to many of its readers this book will be the true discovery of East Africa. Besides a deep love of nature, animate and inanimate, the author has a poet's insight, literary art, and an enviable gift of expression. The result is that we get a clear, vivid, and lasting impression of the country through which he passed. This is specially the case with regard to the wilderness which borders the Pangani, a district where (almost) every prospect pleases, but where "the sun smiteth by day and pestilence walketh in darkness," as the sick-list of the First Division most grievously testified. The alternations of bush and grass, the tawny dust, the swift-flowing river, the aromatic odour of the trodden scrub, the nearer hills, Kilimanjaro ghostly in the far distance, the swamps, the patches of bare sand, the bird and insect life, the men on the march, the sore-driven cattle of the transport—all these become our familiar companions; we even share the home-sickness of the Kavirondo porters as they talk of "lands loved and left."

As a contribution to the history of the campaign in German East Africa the book is also of value; it describes, for instance, the tactics of the Germans in their retreat from Usambara more clearly than was the case in the official despatches. Captain Young had too his perilous adventures, and on one occasion his small camp of wounded men was rushed by an enemy company. The arrangements made for the care of the sick and wounded were inadequate, but risks were taken deliberately. There seems greater room for criticism of the quartering of mounted troops for weeks in most pestilential spots. In the early months of the campaign the British had indeed much to learn concerning the climate and topography of the country, and this and other records show that the pupils were not always very apt. Yet the remarkable driving force of General Smuts and his lieutenants overcame all obstacles—expected and unexpected. We get several thumb-nail sketches of General Smuts, and a pleasing glimpse of Brigadier-General Sheppard, who, having secured the crossing of the Pangani at Buiko, while his brigade was crossing the river sat in his car "reading a play of Shakespeare and well content."

F. R. C.

AMERICA

A Year of Costa Rican Natural History. **Amelia Smith Calvert**, Sometime Fellow in Biology, Bryn Mawr College, and **Philip Powell Calvert**, Prof. of Zoology, University of Pennsylvania. New York: The Macmillan Co. 1917. *Maps and Illustrations.* 12*s.* 6*d. net.*

The authors of this volume are two very keen, observant, and philosophical naturalists—husband and wife, highly trained biologists both of them. Their "primary concern in Costa Rica was a study of the dragonflies with reference to their seasonal distribution." It might, therefore, be naturally expected that their book would be more pertinently discussed in an Entomological than in a Geographical Journal. When, however, the reader has laid down 'A year'—May 1909 to May 1910—'of Costa Rican Natural History' he feels he has obtained an excellent epitome of most aspects of the Republic—its geography and scenery, its ethnology, as well as every department of its biology beyond the dragonflies on which the authors specialized. The book is a more or less popular narrative of the authors' work, unburdened by detailed scientific descriptions.

On their arrival at Limon, the eastern port of Costa Rica, the travellers proceeded by rail to the capital, San José, situated at 3800 feet on the Pacific slope

of the Cordillera Central. The line follows valleys daily subject to uncontrollable floods and is laid on a terrain always in danger of land-slides. The Calverts took up their permanent quarters in Cartago, the second city of the country and once its capital, situated on Mount Irazu at 5900 feet a few miles to the east of the continental divide, on the Atlantic slope. From here their expeditions radiated over most of the Republic, determined by the seasons, which vary greatly on the two aspects of the Cordillera. The climate of the Atlantic slope has a constant tremendous rainfall derived from the trade-winds, while on the Pacific slope the dry and wet seasons are well marked, and many of the trees drop their leaves in the former period. The authors speak with enthusiasm of the wild flowers around Cartago. "In November the colour effect of a number of porós [*Erythrina sp.*] together was astonishingly like that produced by red maples in bloom; the white trumpets of the *Datura* were 10 to 12 inches long, and in April, at the height of its season, covered the plant so thickly that the foliage was almost entirely hidden." Six miles west of Cartago lies the town of Tres Rios, the centre of the best coffee district of Costa Rica. To the north of the city stood a farm of beautiful fertile land laid out in strawberries, "the finest berries and the most perfect plants imaginable."

The whole south side of Irazu below the forest was covered with pastures or big fields of maize or potatoes, with villages or small collections of houses, the highest being 7150 feet above the sea. The authors give a graphic account of their visit to the crater of Irazu, 11,322 feet high,—the highest mountain in Costa Rica with the exception of Buena Vista and Chirripo Grande. The oak forest reaches down to but not below 8890 feet. Their stems were covered with the gorgeous parasitic *Loranthus schiedianus*, whose red, red and yellow or orange flowers are individually very slender, and about 3 inches long; but together form a brilliant mass of bloom. Many birds were singing, their notes nearly all different from any heard at Cartago. In clearings grew clumps of a magnificent and delicately scented composite (*Senecio multivenius*) 8 to 10 feet high and bearing a golden mass of flowers more than a foot across. The cinders of the cone were met abruptly on the upper edge of the forest. The vegetation on the cinders is distributed in patches; the summit itself is bare. The volcano proper consists of a large incomplete "mother crater;" within this are two "daughter-craters," the more western of which contains eight "granddaughter" craters. The floor of the main crater, almost level, is formed of fine ash and cinders strewn with huge boulders, and is a brilliant flower-garden. The crater harboured a robin-like thrush and some small sweet songsters and humming birds; also large yellow bumble-bees. The really active part of Irazu in recent years is on the north side of the mountain at about 9240 feet, outside of all the craters. In clear weather a far extending prospect is obtained from the top, northward to the green forest-covered plains of Sta. Clara with the silver line of the Rio Sucio through it, and out to the Atlantic and Pacific Oceans.

The authors on several occasions witnessed those remarkable and inexplicable lepidopterous migration flocks, in hundreds of thousands—especially of *Uranidia fulgens*, a day-flying moth, and *Timetes chiron*, a diurnal butterfly. The latter "flew along at various distances above the ground, but all in the same direction—generally eastward and against the wind."

The town of Juan Viñas, 3300 feet lower down the Reventazón Valley on the floor of an old crater, is remarkable for the extraordinary fertility of its soil and for its coffee and sugar plantations. The list of its flowering plants is numerous and varied enough to fill with envy every stay-at-home botanist. Insect life was also extraordinarily abundant. While examining the larvæ and

exuviæ of a dragon-fly (*Thaumantoneura*) the Calverts discovered attached to their bodies great numbers of diatom shells. On a single small leg five hundred diatoms, representing sixteen species, and on the leg of an adult sixty diatoms were identified—an observation which "helps to throw light upon a difficult problem connected with the distribution of diatoms." A very interesting chapter is devoted to the tenants of the almost perennial water reservoirs in the large leaf-sheaths of the bromeliads (pine-apple family). The Costa Rican naturalist Picado has enumerated 290 species of bromeliad fauna, and has proved by experiment that the water in the leaf sheaths retains its purity through the agency of a gum secreted by the bromeliads. That one of the species of mosquito from these reservoirs belongs to a day-flying genus, "decidedly noxious" where they abound, shows how difficult a problem the extinction of these pestilential diptera is. Our authors suggest that the bromeliadicolous habit may have originated in regions liable to extensive inundation, where the epiphytes would afford quite natural places of oviposition.

The central plateaus of Costa Rica, with their healthful climate, beautiful scenery, rich fertile soil, abundant and varied productions of grain, fruit, vegetables, and cattle, are truly a paradise on earth; *but* it is subject to disastrous earthquakes. Devastating tremblores have occurred every few years since the first recorded earthquake in 1638, and our authors had the unenviable experience of witnessing one of the most severe for many years when Cartago was once again in its history totally overthrown, with much loss of life.

'A Year of Costa Rican Natural History' forms delightful reading for every lover of Nature whatever his special interest—geography, biology, ethnology. He will scarcely find a page on which some new fact or suggestive observation or reflection does not occur. H. O. F.

GENERAL

The Black Man's Part in the War.— **Sir Harry H. Johnston.** London: Simpkin, Marshall & Co. 1917. Pp. 128. *Illustrations.* 1*s.* 6*d. net.*

Those readers who, judging this little book by its title, expect to find in it an account of military operations in which black troops have taken a leading or noteworthy part will be disappointed. It deals only incidently with the war, and though a few deeds of individual soldiers are recorded, it is in no sense a record of operations. That is not the author's intention; his aim is to give an account of the dark-skinned population of the British Empire and to show how it is being and will be affected by the war. Condensing, in very readable form, much of his wealth of knowledge of Africa, Sir Harry Johnston describes rapidly the leading African Negro races and brings out the claims on the consideration of the peoples of Great Britain established by the Negro, whose loyalty to the British connection has been excelled by none. The book is, in effect, an appeal that after the war full encouragement should be given the African for the utmost development of which he is capable—that nowhere shall he be exploited merely for the benefit of the white races. Sir Harry regards with warranted approval the methods of government adopted in the Crown Colonies; he is less satisfied with the attitude of Rhodesia and the Union of South Africa to the natives, notably in regard to land ownership and education. He holds that the Zambezi forms "a most important dividing line, and that Northern cannot be fused with Southern Rhodesia in an administration which would equally contain whites and blacks." He would form a new British Central Africa composed of Northern Rhodesia, Nyasaland, and part of German East Africa—for which last he adopts the name "Zangia."

This statement of the case for the Black man should receive serious attention ; it may be hoped that it will help to create a sound public opinion on the subject and remove, in part at least, that "national ignorance" of which the author complains. It may be added that the scope of the book includes the natives of the Pacific subject to Britain and the West Indians of Negro origin.

F. R. C.

Modern Man and his Forerunners.— H. G. F. Spurrell. London: G. Bell & Sons. 1917. *Sketch-maps and Illustrations.* 7*s.* 6*d. net.*

This book contains a sketch of the rise of man as one of the Primates to his modern civilized state. At the outset the author assumes, in agreement with the extreme views of Prof. Keith, that 200,000 years ago man existed practically indistinguishable from his modern representative. Alongside with this persistent type there existed for a period another long ago extinct. What brought about the extinction of this Neanderthal type is an unsolved problem. These two types the author speaks of as light and heavy, comparing them with light and heavy forms of monkeys, exemplified in the chimpanzee and gorilla. These two types of man and their culture, under the designation of Cro-Magnon and Neanderthal, are then discussed in detail. In the light of our present knowledge culture has little meaning as applied to Neanderthal man. But the high artistic powers of the Cro-Magnon race bring before us the most interesting phases of prehistoric culture. A chapter is devoted to "The Growth of Human Power and Numbers in the Neolithic Age." That the Neolithic Age was one of great advance there is no doubt. It is not a matter of speculation, but of fact. The improvements in implements and habitations, the invention of pottery, the discovery of agriculture, and the raising of tumuli over the dead are sufficient testimony. How far this was the result of increase of numbers, intensifying the struggle for existence, and stimulating the dormant faculties of invention and inquiry, is with our present limited knowledge a matter of speculation. The author points out what is often overlooked, that natural selection may act through competition between communities. He shows that a community gains in strength in proportion as it divides its work and specializes its workers, concentrates control under a central authority, improves discipline and fosters the self-devotion of individuals, represses strife among its members, and increases mutual help and protection.

All this takes up about half the book, and may be said to be preliminary to the rest, which is an essay on Civilization, its origins, growth, spread, realization and decline. According to the author civilization is essentially slavery, there is a struggle for existence between civilizations, and it is intermittent. The fundamentals of civilization are similar, and all civilizations rise to a maximum and then decay. The discussion of these problems is very interesting, and full of acuteness and thought and worthy of careful perusal. It is a large subject to tackle in a hundred short pages, and consequently the essay is somewhat sketchy in character. Mr. Spurrell writes with force and confidence, at times it might perhaps be said with dogmatism, but that he singles out with insight the weaknesses of civilization and its different forms of government, including the modern panacea of democracy, cannot be denied. The sureness he evidently feels of his own standpoint is not always supported by a sufficiency of illustrations to gain unqualified acceptance. But the scientific mind entering the arena of politics unbiased by prejudice and shibboleths will sympathize with his point of view, and in the main agree with his conclusions. He attacks the most absorbing problem of our age, the all-important, even tragic character of which the majority of people seem quite to ignore. The inter-relations of

civilization and government discussed by Mr. Spurrell assuredly deserves the careful study of all thoughtful persons. When many of the greatest nations of the Earth appear to be agreed that democracy is the only form of government worth fighting for, and that on it depends the future happiness and salvation of mankind, a thoroughly scientific study of government is very desirable. The work was written, the author tells us, before the present war broke out. In a postscript he comments on the statement that it is the greatest war in history. The bearing of much he has written on the struggle now going forward between autocracy and democracy, their strength and weakness, so well exemplified by Germany on the one hand and Russia on the other, is only too obvious, and makes the appearance of his book at the present moment by no means inopportune. E. A. P.

THE MONTHLY RECORD.

EUROPE

Origin of the "Moëres" of Flanders.

Of the low-lying tracts along the seaboard of Flanders near the Franco-Belgian frontier, to which the war has directed so much attention during the last three years, the section between the Belgian town of Furnes and Dunkirk has long been known as *Les Moëres*, a French variant of the Flemish word *moer*, a marsh. Lying scarcely a metre above low-tide level, this tract is perhaps the lowest in altitude of the whole maritime plain from Calais to the Scheldt, and would be constantly flooded by the sea were it not that it is separated from this by a belt of ground of a higher elevation, reaching to 3 metres even at its lowest point. Forming thus a depressed basin without outlet the *Moëres* had long an evil reputation for the fevers bred of their marshes, until at last drained in the seventeenth century by an undertaking somewhat remarkable for the time, which consisted in the digging of a canal round the outskirts of the tract, into which the water was pumped by a series of windmills. Flooded once more as a defensive measure during the wars of the middle of that century, it was only in the nineteenth that it was finally rendered suitable for cultivation and human habitation. Various writers have dwelt upon this interesting history, but none apparently have hitherto attempted to explain the origin of the *Moëres*. This has now been done by Prof. R. Blanchard, whose excellent work 'La Flandre,' published by Armand Colin in 1906, is the standard authority on the geography of the Flanders plain (*La Géographie*, 1916–17, No. 5). M. Blanchard shows that there can be no question of a local sinking of the ground, and points out the close connection which evidently exists between the basin and the belt of dunes which shuts it in on the north and north-west, and which from geological evidence is proved to be by far the older feature of the two. Therefore the dunes must be looked to as the originating cause of the basin, and not *vice versâ*. The Flanders plain as a whole owed its formation to the quaternary transgression of the sea, which spread over it the sediments which now form its floor. The *Moëres* were however protected by the rampart of ancient dunes, at the ends of which the tidal current threw down its deposits and so further enclosed the low-lying tract behind them. This history does not stand alone, but was repeated at various other points on this coast, where ancient belts of higher ground have preserved low-lying areas from being covered by marine deposits.

The Location of the Cassiterides.

The vexed question of the location of the Tin Islands of the ancients is once more discussed in the *Geographische Zeitschrift* (1917, No. 4) by W. J. Beckers, who will have it that the Cassiterides are to be identified with Ushant or other islands off the coast of Brittany. On the assumption that the idea of the tin islands was really based on definite knowledge of an early emporium of the tin trade, and not on mere vague rumours of lands in the western ocean producing this metal, the theory is a probable one (though not altogether new), for it is now generally recognized that there is little to be said for the old identification of the islands with the Scilly group. Herr Beckers lays stress on the account given by Avienus in his 'Ora Maritima' of the Oestrymnides—which, from the mention of tin as one of their products, he takes to be identical with the Cassiterides—as pointing with certainty to the islands off the extremity of Brittany, itself represented by the lofty headland of the poet, reaching out towards the warm south wind. He holds with justice that this position would be eminently fitted for an emporium of the early trade in tin and other products of Western Europe, being much more accessible to southern voyagers than the coasts of Great Britain. It may be noted that Nansen in his 'Northern Mists' also favours a position of the Cassiterides off the French coast, though he would place them further south, near the mouth of the Loire. One difficulty in the way of a satisfactory identification has been the general belief of the old writers that the Cassiterides lay out in the ocean north of Spain, and not near any mainland; but it is quite intelligible that in the mist then enveloping all Europe beyond the pillars of Hercules such a notion should have been attached to the extremity of Brittany, separated from Northern Spain by the whole width of the Bay of Biscay.

AFRICA

Return of Commandant Tilho.

We note with pleasure the safe return to France of the well-known African traveller, Commandant Tilho, after five years' service in the Lake Chad region. During the last three of these he was in charge of the circle of Faya in Borku, guarding the north-eastern frontier of the Chad military territory from enemy attacks from the side of the desert. Commandant Tilho's keenness in the interests of geography had been abundantly proved by his previous record of work in the Central Sudan, and he seems to have made full use of his latest opportunities for extending our knowledge of the long-forbidden regions between Lake Chad and the Libyan desert, including the Tibesti highlands. Towards the end of 1915, when in pursuit of marauding bands of Tubus, he penetrated into the southern part of the highlands, traversing the principal valleys of the Kussi massif, and climbing its highest peak, which is said to have an altitude of some 10,000 feet. It is an ancient volcano with a well-preserved crater 1000 feet deep. Commandant Tilho has devoted much care to the construction of a map of the whole region, based on astronomical observations, which will be a welcome addition to the cartography of this part of Africa. His return route was through Wadai and Darfur to Khartum, where he received a warm welcome from the British authorities.

AMERICA

The Rainfall of California.

A monograph on this subject by Alexander G. McAdie constitutes No. 4 of Vol. 1 of the *University of California Publications in Geography*. It is a

valuable contribution furnishing a large amount of statistical data for the different portions of the state and discussing in some detail the various factors which control the precipitation of the region. California belongs to the warmer temperate "Mediterranean" type of climate characterized by summer drought and winter rains, and in these important respects the region is similar to the Mediterranean countries, however much it may differ therefrom in other aspects of climate. The seasonal character of the rainfall is well exemplified diagrammatically for twenty-five selected stations, nearly all of which show a trifling quantity in June and July, and a conspicuous maximum in December and January, the average fall in each of these months amounting at Eureka to some 7½ inches. Whilst the high mountains and consequent complexity of physical features cause considerable local variations in the total yearly rainfall, it may be said that the heaviest precipitation occurs in the north-western part of the state, where there are tracts of country with 50 to 100 or more inches, and the lightest in the south-east, where there exist desert areas with 2 inches or less. The greatest fall in any year took place in 1909 at Monumental, Del Norte county, where 153·54 inches were recorded. During January of the same year 71·54 inches fell at Helen Mine. For the maximum monthly fall California is stated to hold the record among the states of the Union, but the highest day figure is claimed for Louisiana—that of 21·4 inches in twenty-four hours at Alexandria on June 15–16, 1886. At San Francisco, where rainfall observations have been maintained for sixty-four years, the average annual fall is 22·6 inches distributed over 67 days, the wettest month being January with 4·89 inches and the driest July and August with only a trace, 0·02 inch. In the wettest January (1862) 24·36 inches fell, but in the driest (1852) only 0·58 inch. The heaviest 24-hour fall at San Francisco occurred on 28 January 1881, when 4·67 inches fell. In 1903 an absolute drought extended from April 16 to October 9, and in 1911, the summer of which was also very dry in England, from June 16 to October 1. The snowfall of California, though insignificant along the coast, is very heavy among the high mountains, and the annual amount which falls in the Sierra Nevada is the greatest in the United States and probably represents an intensity of snowfall not surpassed, if equalled, in any other mountain system in the world. At Summit, Placer County, some 7000 feet above sea-level, the average annual snowfall is 36 feet, the extreme variations being between 65 feet in 1879–80, and less than 20 feet in 1880–81. This snowfall, though of great economic importance to the State, is a serious obstruction to railway traffic, and it is well known that on the Southern Pacific Railway snow-sheds have had to be constructed over a length of 40 miles. At Summit 86 per cent. of the precipitation falls as snow, the 14 per cent. of rain being practically confined to the months of July, August, and September. The one defect of Mr. McAdie's highly useful publication is the entire absence of place-names on the hyetographic and relief maps produced. The foreign reader, unless he has travelled in California, can hardly be expected to tax his memory with the location of any but the major geographical features and more important places.

POLAR REGIONS

Ice in the Arctic Seas.

The valuable reports on the State of the Ice in the Arctic Seas issued annually by the Danish Meteorological Institute have frequently been referred to in the *Journal*. The investigation has now been carried on for twenty-one years, and it has been thought that the material collected is sufficient to justify an attempt to combine it into a general summary. Such was therefore

issued by the Institute last year (1917) in addition to the annual report on the state of the ice during 1916. Mr. Speerschneider, who has prepared it, is fully alive to the provisional nature of some of the conclusions, by reason of the gaps in the observations and their uneven distribution both in time and space ; but when this caution is borne in mind the results are of much interest and value as showing the conditions likely to occur in normal years in the several parts of the Arctic area covered by the investigation, as well as the deviations in exceptional years. The data have naturally been most plentiful for the seas north of Europe (with extensions to the Kara Sea in the East and Davis Strait and Baffin Bay in the West), but a certain amount of information is also given for the Bering and Beaufort Seas. The letterpress deals with the successive areas in turn, tracing the movements and variation of the ice in an average season as well as in exceptional cases. A series of charts represents graphically, for each of the months April to August, the outer limit of the Polar ice proper on the mean of the sixteen years 1898–1913 from the southern part of Davis Strait to Novaya Zemlya, as well as the maxima and minima for the same period. In regard to these last it is to be remembered that the curves do not represent the state of things actually prevailing at any one time, the maximum or minimum extension having of course not occurred simultaneously at different parts of the curves. The charts bring out clearly the general blocking by ice of the Greenland coasts—the whole of the east side and the southern extremity on the west—even during the summer months, and the relative accessibility of the sea areas west of Spitsbergen and (in a less degree) of Novaya Zemlya. Only the southern quarter of East Greenland is shown as ice-free in August even under the most favourable conditions, while under similar conditions the minimum limit (as explained above) runs completely north of Spitsbergen to the neighbourhood of Franz Josef Land. Normally North-West Spitsbergen is ice-free by May, though the conditions on the east are very much less favourable, and only exceptionally is it possible to circumnavigate the group.* Normally again almost the whole west coast of Novaya Zemlya is ice-free by July, though in unfavourable years most of the coast, with the exception of the approach to Matochkin Shar, may be fringed with ice even in August. The areas occupied by ice in the Kara, Barents, and Greenland Seas during each of the months April–August throughout the period of observation are given in tables.

MATHEMATICAL AND PHYSICAL GEOGRAPHY

Oceanographical Investigations by the "Bache" in the Western Atlantic, 1914.

Mr. H. B. Bigelow describes the main results of a cruise carried out in 1914 (January to March) under the auspices of the U.S. Bureau of Fisheries, in Document No. 833 of that Bureau, originally forming Appendix V. to the Report of the Commissioner of Fisheries for 1915. The work was carried out in the S.S. *Bache*, lent for the purpose by the Coast and Geodetic Survey, under the direction of Mr. W. W. Welsh, and the ocean area examined lay between the southern Atlantic coast of the States and Bermuda, the Bahamas, and Cuba, limitations of gear confining the observations almost entirely to the upper 1800 metres (on p. 6 fathoms is accidentally substituted for metres). Interesting conclusions are drawn as to the distribution of temperature and

* In noting the years in which it has been possible to sail round the north-east coast, Mr. Speerschneider says nothing of 1915, in which, according to Mr. Hoel (*Journal*, October, 1917, p. 395), the sea on this side was unusually open.

salinity both vertically and horizontally over the area examined, the results sometimes confirming, sometimes supplementing those of previous investigations. The surface water showed four distinct temperature zones: (1) The coast water, 15° C. or colder, off Chesapeake Bay and probably extending though with rising temperature to Savannah; (2) the general warm water of the Antilles drift, over 20° C.; (3) the super-heated water coming from the Gulf by the Straits of Florida; (4) a comparatively cool region west of Bermuda. This distribution agrees well with the existing temperature charts and may be taken as normal for the time of year. In the eastern half the salinity agreed well with the surface temperature, while further west the salinity curves so far as drawn run parallel to the coast, indicating a progressive freshening as it is approached. Vertically the temperatures show a general cooling from 19°–22° C. on the surface to about 4° at 1800 metres, at which depth both temperature and salinity curves all approach a uniform value, while they show the greatest variation at mid-depths between 500 and 1500 metres. Many points of interest are brought out in the detailed discussion of the sections and profiles of both features, which cannot be entered into here. Special attention is given to the observations in the Florida Channel and out over the continental shelf from Chesapeake Bay. In the former area the banking up of colder water against the Florida coast was well brought out, and in the latter too the existence of a typical "cold wall" along the coast was revealed, separated from the cold abyssal water by a band of warmer water washing the bottom at the 200-metre level. The salinity records gave distinct indications of a waterfall or down-flow of coast water towards the depths. It is uncertain whether such a downpour is general along the coast, but its occurrence even locally suggests that such a phenomenon may play an important rôle in the manufacture of the deeper layers of the coast-water on the shelf. No confirmation of the occurrence of an "Arctic" current on this coast could be found.

GENERAL

Prof. Albrecht Penck.

From time to time highly coloured stories appear in the newspapers describing the activities as a scientific spy of Prof. Penck, who received the Founder's Medal of our Society in 1914, and was an Honorary Corresponding Member until his name was removed with those of other enemies. Since it is probable that these accounts give him too much credit, it seems to be worth while to make a plain statement on the facts of his visits to England, his journey to Australia, and his detention upon his return in the autumn of 1914. Prof. Penck had on several occasions travelled with students along the south coast of England and the east coast of Scotland, collecting information of a geographical kind which might possibly have been intended for the use of the naval and military authorities, though an innocent interpretation of his activities is by no means excluded. In any case it is absurd to suppose that in the course of brief visits to these coasts he could have done very much to supplement the detailed and complete maps of the Ordnance Survey and the charts of the Hydrographer to the Admiralty, all of which were on sale, and naturally in the possession of the German authorities. Prof. Penck visited Australia as a foreign guest with the British Association, and was met on arrival in that country by the news of the outbreak of war. The more discreet and thoughtful visitors of enemy nationality immediately returned home; others—including Prof. Penck—ignored the hints that they might find it more pleasant to return, and announced their intention of carrying out their programme. Those who

remained were treated cordially, and every effort was made by their hosts to avoid any reference to their peculiar position. On his return from Australia Penck was given a safe conduct to England. During the voyage he was guilty of indiscreet discussion with neutrals on the probable size of the indemnity which Germany would obtain, and on arrival at Aden he committed the further indiscretion of making sketches in the harbour, which was reported to London. He was not allowed to leave the ship at Malta, as he apparently expected, and was detained at Tilbury on his arrival in England, to which he had been given a safe conduct. All his photographs and sketches were seized by the authorities of Scotland Yard, but we understand that though voluminous they contained nothing of an incriminating nature. He was refused permission to return home, and was restricted to a radius of 5 miles from the boarding house in South Kensington where he established himself. His proposal that he should be allowed to pursue his studies in the Library and Map Room of this Society was not accepted. After the defeat of Von Spee's Squadron in the battle of the Falkland Islands he made representations to the authorities that whatever he might have learned in the southern hemisphere could be of no further use to his Government, and he was eventually allowed to return home. He published a somewhat dull account of his detention in England, of which we remember only the passage in which he describes how he "wandered in the fields near Wormwood Scrubs on the periphery of his circle." The *Daily Mail* of November 23 announces that he has recently been made Rector of the University of Berlin, and considers the appointment a recognition of his secret services to the Kaiser and the German Admiralty. If this be so we think that he must be reckoned as having obtained promotion fairly easily.

Books for British Prisoners.

The Chairman of the British Prisoners of War Book Scheme (Educational) asks the attention of the Society to the needs of that organization, whose object is to provide British Prisoners of War interned in enemy or neutral countries with books for the purposes of study. A pamphlet on the work of the scheme is placed in the Reading Room, and shows a wide range of subjects in which books have been supplied. It should be understood that the Committee require the best and most recent text-books. Any of our readers who may be able to offer books of this description should first send a list, giving if possible the date and edition, to Mr. Alfred T. Davies, C.B., Board of Education, Victoria and Albert Museum, S.W. 7, and endorse the envelope "Prisoners of War."

CORRESPONDENCE

The Pilgrimage of Symon Semeonis

IN the very interesting study of the pilgrimage of Symon Semeonis by Mr. Mario Esposito in the *Geographical Journal* for November 1917 (vol. 50, No. 5) the voyager's arrival at Glarentza or Clarenza in the Morea is referred to, and Symon is said to have recorded in his narrative that the governor of Glarentza was the Lord Nicolaus de Genenillas, a name which Mr. Esposito, no doubt rightly, assumes to be corrupt. The Governor's citadel was on a hill about 5 miles off. This citadel was of course the famous castle of Chloumontzi, Clairmont, or Castel Tornese, built by Geoffrey Villehardouin II. early in the

thirteenth century, the majestic ruins of which still crown the promontory of Chelonatas opposite the island of Zante. As regards the name of *Genenillas*, it seems not impossible that it may be a corruption of Semenilius, a name actually found on a monument of the fourteenth century, the remains of which still exist. About halfway between Clarenza and the Castle of Clairmont, on the slopes of the promontory, is a little monastery bearing the name of Vlachernæ, and with an interesting church displaying a mixture of the Frankish and Byzantine manners. It contains a canopied tomb with no inscription. I have elsewhere suggested that it may have been built to contain the grave of the Emperor Robert, who died in Achaia in 1228, and therefore called after the imperial palace at Constantinople. Fixed to a wall in the court are fragments of a slab removed from the church, bearing the name Semenilius. When Buchan visited the monastery in 1840 this slab was still part of the pavement of the church, and near the door. He transcribes the inscription thus: "Anno Dni MCCCLVIII Die XX Mensis Septembris hic jacet Semenilius sti Viridi Mileti de Lucinia qui habitat Veneciis." It also bears a shield with a lion rampant. The slab has been damaged in removal. Certain letters of the inscription are missing, and others I found illegible on my last visit. Symon Semeonis was at Clarenza in 1323. The Semenilius of the monument did not die till 1358. But there is nothing in these two dates to make it impossible that the Genenillas of the narrative and the Semenilius of the monument are the same, and the resemblance between the two names, one of which is presumably corrupt, is certainly striking.

One other point. The travellers sailed past "*Corna*," no doubt Corone, *Maina* and "*Companum*," a fort of the Greek Emperor, and so to *Porto Quaglio*. Now, it would be right to describe Maina as a fort of the Greek Emperor, if the castle be referred to, for it was handed over to the Greek Emperor in 1262 as a condition of the release of William Villehardouin from captivity at Constantinople. But what are we to make of "Companum," and how comes it to be described as a fort of the Greek Emperor? Moreover, Maina, the castle or fort, would be more properly referred to with or after Porto Quaglio, to the north of which it is situated, so that it would be the last of these places to be enumerated by a traveller rounding Cape Matapan. It would also be a strange omission on his part not to have mentioned this remarkable headland. I therefore put forward the following suggestion, but with hesitation, not having seen the original text of Symon Semeonis. The Maina, or Mayna, here referred to is probably not the castle, but the whole of the region so called occupying the length of the ancient Tænarian peninsula. A traveller sailing across the Gulf of Culumata from Corone would arrive at the district of Maina (modern *Mani*), not at the fort, which is on the other side of the promontory, though indeed it may be visible across the land. "*Companum*" is perhaps a name derived from a hasty glance at one of the coast charts or *portolani* spoken of on p. 349 of Mr. Esposito's article, and should be *Co* for *Capo* and *Metapanum*, *i.e.* Cape Matapan.

RENNELL RODD.

British Embassy, Rome,
16 November 1917.

The Inca Treasure of Llanganati

I beg to bring to the attention of your Society the enclosed copy of an editorial in the *N.Y. Sun* for November 4 and my reply thereto in the issue of the 14th, which I also enclose.

Since it was in your *Journal* that Mr. Spruce's article and Señor Guzmán's

map were first published, I have always intended to send you a report of my discoveries; but I hoped to make a third journey; and, indeed, for the last three years plans have been made each autumn for my going. The financial man has, however, each time been prevented from going, although last year he bought the outfit recommended by me, and now has it ready for next year.

Mr. Stabler's article has taken me by surprise and has rather forced my hand before I was ready to go into print. However, I think well, in case anything happened to me, to have it go on record that the Valverde "Derrotero" as published first in your *Journal* (about March 1860) is substantially correct and surprisingly so considering that it was written on a deathbed in Spain and after some years of absence of the writer from Ecuador.

[The article in the *New York Sun* of November 4 is based on the passages in Mr. Stabler's paper (*G.J.*, October 1917, **50**, 251) which summarize the story of the Inca treasure, and mention the unsuccessful search made by Major Brooks, whose letter to the *Sun* of November 12 we have the pleasure to print below. Major Brooks has kindly undertaken to give us further news of his quest at a later date.—Ed. *G.J.*]

[*New York Sun*, 12 Nov. 1917.]

THE WAY TO THE GOLD OF THE INCA LIES OPEN TO ALL.

A Hunter of the Treasure which was to ransom Atahualpa tells of his Adventures in Ecuadorean Mountains.

More than any one else, perhaps, I was interested in the editorial article in *The Sun* of Sunday, 4 November 1917, entitled "The Way to the Gold of the Inca," because I am the Major Brooks spoken of, who made two expeditions into that part of the Ecuadorean Andes called the Llanganati Mountains, in which there is much reason to believe the hidden treasure of the Incas is located.

I wish to correct some errors which seem to be in the original article which you discuss. I make these corrections with the most kindly feelings towards Mr. Stabler, the author, whose friendship I esteem most highly. His memory is a little at fault as to some parts of what I related to him, but he cannot be blamed for this, considering the time that has elapsed since 1910, when I made my trips into that wilderness.

It must be conceded that the one who underwent the peculiar hardships of climbing in those rough and uninhabitable regions must have had the incidents more indelibly impressed upon his memory than they could have been impressed upon the memory of any one by mere narration. During my first and second expeditions Mr. Stabler was the secretary of our legation in Quito, Ecuador, where I was well acquainted. In fact, for my protection in case I should find the treasure, I fully consulted the American Minister before starting on my second expedition, because from the results of my first expedition I felt sure of locating the treasure in my second trial.

My first journey was a failure because I went not sufficiently provided to stay long, and because, while climbing the "margasitas" mountain to get a look-out to see where the three Llanganati peaks were I had a fall that caused a stick to be thrust in my eye. The eye became quite irritated and swollen, although I bathed it frequently in cold water, of which in those high regions there was more than an abundance. On my return to Quito the doctor prescribed hot water and an eye wash which cured it.

It was the second journey when my Indian bearers deserted me—and this

was when I had just pitched my camp on the edge of a lake—that proved my undoing.

This small lake lay at the base of one of the three Llanganati peaks, and since it had no visible outlet must have had a subterranean one. It was bordered on one side by a somewhat dangerous morass or swamp. I broke through the sod of this swamp and went down the full length of one leg without touching terra firma. This lake was very much like the one described in the "Derrotero" or itinerary, and since, on account of continual fogs, I had not yet seen the third and most beautiful peak (Llanganati is the Quichua or Inca word for "beautiful") I wanted carefully to examine this mysterious lake and marsh.

I had no more than constructed a rude shelter for my party when the Indians, on account of the rains and hardships, deserted me, and from these rains the lake rose gradually, finally coming up about 25 feet—away above what would have been the roof of my shelter had it remained standing instead of floating off on the surface of this little lake.

I had employed a young Ecuadorean and I had brought my servant or valet with me. These did not desert. We remained three days without fire, and after five days a relief party came out to bring me back, but on condition of not remaining in those regions.

Before this I had seen the third or most beautiful peak and found that I was within about 6 or 8 miles of it. The day that I started back was clear, and I got such a beautiful view of the third mountain that I could have cried at having to return, but I resolved to go again in a better season of the year. I had unwittingly gone in the rainy season. The seasons there in the interior were reversed, strange to say.

Regarding the "Derrotero" or itinerary of Valverde, I wish to correct the statement that I had been mystified by part of the directions in the itinerary. I had gone in there fully aware of this possible mystification, because I had read of so many people going astray by being unable to understand the diagram or hieroglyphic and make it fit the other directions. But, on account of my military education and training in map making and topography, I was conceited enough to believe that I could do better than any one before me and follow the itinerary correctly.

I did not construct a map from the "Derrotero" or guide, but I made a tracing of the map that appeared in the *Geographical Journal* of the Royal Geographical Society of London about March 1860. By the way, this map is by no means according to scale—in one day I walked what was represented by about 4 inches on the map. The next day, going just as far, I covered only 1 inch on the map.

I had no trouble in finding all of the landmarks of the guide up to and beyond the "Way of the Inca," and I had no trouble about the correct side on which to pass the "mountain which is all margasitas." By the way, this proved to be one of the "three peaks" mentioned in the "Derrotero."

The "Derrotero" or guide was for the purpose of guiding a party over the most practicable way of reaching the three peaks. I reached two of these peaks and plainly saw the third from its church spire-like top to its very base. This third—the beautiful mountain—is somewhat like Trinity Church with a saddle in the roof and this part snow covered, but the peak or tower of mica schist, and black, is so steep that snow cannot lie on it.

Let me make this clear and emphatic that the Valverde "Derrotero" or guide is correct and that the "three Llanganati peaks in the form of a triangle"

do exist ; and that a person in good health and of ordinary strength can reach them if properly provisioned and properly guided.

It took me two journeys to find the right way, but now I do not need the "Derrotero." Those who wish to see part of the map from which I made my tracing will find this and also the full "Derrotero" in the appendix to the second volume of 'Notes of a Botanist of the Ecuadorean Andes,' by Richard Spruce, a copy of which is in the New York Public Library.

E. C. BROOKS.

Prof. Bowman's 'Andes of Southern Peru'

One who relies as much as I do on characterizations of new books in the *Geographical Journal* would very likely be deterred from reading Bowman's 'Andes of Southern Peru' by J. W. Evans' review of it in the issue for September, although the book commends itself to me very highly. It will be merely fairness if you allow me to point out in your pages that Mr. Evans has quite misrepresented the scope and nature of the book. I am not referring to his judgments or opinions, but matters of obvious fact.

How did Mr. Evans get the idea that the book "presents a compendium of the results obtained by the expedition sent out in 1911 by Yale University to Peru"? It does nothing of the sort. It is—and claims to be—a full and final account of the geographical reconnaissance along the 73rd meridian, which Dr. Bowman conducted for that expedition, and it does not in any way treat of the three other important objects of the expedition which were looked after by other members. I do not conceive for a moment that the leading geographical publication in England would knowingly allow so distinct a misstatement as this to be made in its pages. The title-page is enough to contradict it. The preface goes further, and the book itself, if glanced over, would make it quite clear that it is not a compendium at all, and that it contains no reference at all to the important archæological work of the expedition. Surely the most hasty reviewer must give that much attention to any book that he "reviews"!

In his second paragraph Mr. Evans suggests that duplicate maps on the same scale, of contours and vegetation, etc., of actual districts in Peru would be better than Bowman's regional diagrams. No doubt: and their cost, both in time and money, so great that they were quite impracticable for this expedition. A survey must always be supposed to be better than a reconnaissance, especially a reconnaissance along one meridian in a singularly difficult country. Such a comment is out of place in a book that professes to be an account of a reconnaissance.

As long as Mr. Evans has revealed his small estimation of reconnaissance methods, I venture to say that if he had been a closer student of the trend of modern geography in America, where Mr. Bowman's work originated, he would be less intolerant of them. The diagrams appear to me to be a valuable means of expression on reconnaissance work. I think Dr. Bowman is to be commended for introducing them. It is true they are novel, but that is rather a reason for greeting them hospitably until we see how well they serve us in grasping and conveying to others geographical relations. That they will need revision when full surveys are made is probable, since that is the nature of reconnaissance work. In the mean time they present the clearest available picture of the geographical regions of Peru.

Mr. Evans' third paragraph has no relation whatever to Bowman's book. Nowhere does Bowman treat of transportation in Canada, Bolivia, and Brazil. These are simply philosophizings of Mr. Evans that are out of place here.

In an earlier paper Bowman has treated of the "earlier and greater glaciation which Hauthal considers," etc. But he found no evidence of it along the 73rd meridian. Mr. Evans' fourth paragraph comments that he makes no reference to it. Why should he?

The paragraph on the geological portions of Bowman's work again gives no idea of his treatment of the geology of the Andes along the 73rd meridian, but occupies itself wholly with a minor matter.

An author has a right to fair play. A man who writes what appears to be a review is under distinct obligation to state correctly the author's purpose and his method of moving toward that purpose. In both respects it seems to me that Mr. Evans has failed in reviewing Bowman's book. His remarks do not apply to the book he is reviewing.

Yours very respectfully,

MARK JEFFERSON.

Ypsilanti, Michigan, 29 October 1917.

We are glad to print Mr. Jefferson's letter if by so doing we can remove any feeling that we have done injustice to Prof. Bowman's work on 'The Andes of Southern Peru.' While it is difficult in these times to do full justice to a large and important work within the brief limits of a page, we may express the hope that general opinion will not find our reviewer guilty of the several distinct misdemeanours with which he is charged by our correspondent. It is true that the first sentence is open to misconception. The book deals with geographical results only; but if compendium is to be taken strictly in its dictionary meaning, then we can but suggest that our reviewer was hoping for a further output of detailed results and was looking upon the present work as a first account of the whole. However that may be, we gladly withdraw the word "compendium," and take this opportunity of making it clear to our readers that Prof. Bowman's book does not attempt to deal with other branches of the expedition's work, with which we have already been made familiar by the kindness of Prof. Hiram Bingham himself. Secondly, while we do not wish to insist upon any criticism of the "regional diagrams," we think that it was not unreasonable of a reviewer to suggest the advantage of diagrams separating the relief from the rest of the information and showing actual country. His words were surely not intended to suggest fully contoured topographical maps, but the separation of the contours or form lines or other representations of relief from the forests, agriculture, industries, and transport, which are perhaps rather too much to get all together into one diagram. Thirdly, the suggestion, derived from personal experience, that the Canadian canoe would be useful upon the rivers of Peru, was not, we think, out of place in the discussion of a geographical reconnaissance. Fourthly, our reviewer's remark that the author makes no reference to an earlier glaciation is a statement of an interesting fact. Prof. Bowman said nothing about such glaciation, and therefore presumably did not observe any signs of it. As the matter was dealt with in a later page of the same number of the *Geographical Journal*, it was natural to make this comment. Fifthly, the paragraph on geology, though unable in twelve lines to give a complete idea of the treatment, has tried to express the general results compendiously; and unless the whole is "a minor matter," we think our correspondent's complaint perhaps does our reviewer also some injustice. Finally, may we express the earnest hope that "what appears to be a review" has not altogether failed to convey an adequate appreciation of the merits of

Prof. Bowman's book, even though it did not insist upon it as "reconnaissance"—a term which is itself perhaps too modest for a book which has reached a quite considerable completeness. ED. *G. J.*

MEETINGS: ROYAL GEOGRAPHICAL SOCIETY: SESSION 1917–1918

First Evening Meeting, 12 November 1917.—The President in the Chair.

ELECTIONS.—Horatio Victor Bailey; Miss Bannister; Bimbashi Thomas Garnett Newman Bardwell; Samuel Barnett; Miss Mary Pettus-Batchelor; Austin Alexander Rodney-Boyce; Rev. W. L. Broadbent; Rev. Henry Sinclair Brooke, M.A.; William George Buchanan; Capt. Robert Strickland Cholmley; Miss Matilda Irene Cotton; Lieut. Phineas Henry Emanuel; Richard Enraght Hale Fletcher; Thomas Barter Gilley; Lieut. John Edgar Harrison; Lieut.-Colonel Herbert Roche Hayter, D.S.O.; Rev. E. Heywood (Serg. C.E.F.); Lieut. Adrian Fosbroke-Hobbes, R.F.A.; Edwin Frederick Homfray; Lieut. William Wykeham Jacomb, R.N.; Miss Lorna Angas Johnson; Richard Spencer Johnson; John Richard Ockleshaw-Johnson; Mrs. Agnes Henrietta Ida March Phillipps de Lisle; Senhor Pedro Loureiro; George Mackenzie; Gerald Maxwell; John Michell, F.S.I.; Henry I. Mylius; Miss Frances E. Newton; Major Harold de Pass; William Samuel Payne; Otis Manchester Poole; Major Richard Aloysius Quigley, R.E.; William John Robertson; James Frederick Staton; Walter B. Sloan; Lieut. Vincent Harold Sykes; Capt. Athol Tatham; Capt. William Derrington Turner, I.A. (ret.); Bertram Charles Wilderspin, B.A.; Capt. Severn Williams; Marcy S. Woods.

PAPER: Some Geographical War Problems in the Near East. The President.

Second Evening Meeting, 26 November 1917.—The President in the Chair.

ELECTIONS.—Capt. J. S. Barnes, R.F.C.; Lieut. J. H. Blair, D.S.O., R.N.; Mrs. Benson; W. E. Chester; G. H. Craig; Capt. I. J. Duncan, D.S.O., R.E.; R. J. G. Dunning; Charles Jewell; J. A. Jordan; Mrs. J. A. Jordan; W. Paton Ker, M.A., LL.D.; C. D. La Nauze; Major J. Howard MacDonald; C. G. McEwen; Lieut. W. C. Murdie; Arthur Richardson; Benjamin Robert Shephard; Capt. Charles F. Strange, R.A.M.C.; Sir W. Willoughby Williams, Bt.

The President announced that Mr. James F. J. Archibald, a Life Fellow of the Society, who is referred to in an official statement published in Washington last September as having acted in the interests of the enemy, had, by a resolution of the Council taken that day, ceased to be a Fellow of the Society.

PAPER: The Geography of the Italian Front. Magg. Cav. Filippo de Filippi.

First Afternoon Meeting, 19 December 1917.—Dr. H. R. Mill, Chairman of Research Committee, in the Chair.

PAPER: Sandbanks and Deltas. E. C. Barton.